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BRIDGES - BUILDINGS - CONTRACTING - SIGNALING - TRACK

New Series, Vol. VIII
Old Series, Vol. XXVII | *Chicago* JUNE, 1912 *New York* | No. 6

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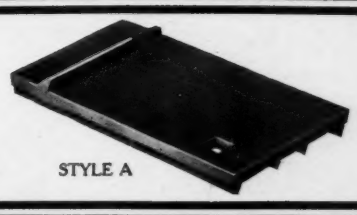

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Alphabetical Index to Advertisers, Page 20.

Classified Index to Advertisements, Page 4.

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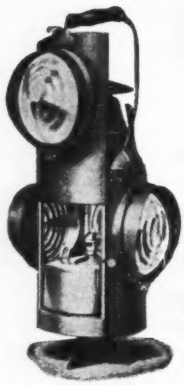

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With such results is it wise to take chances?

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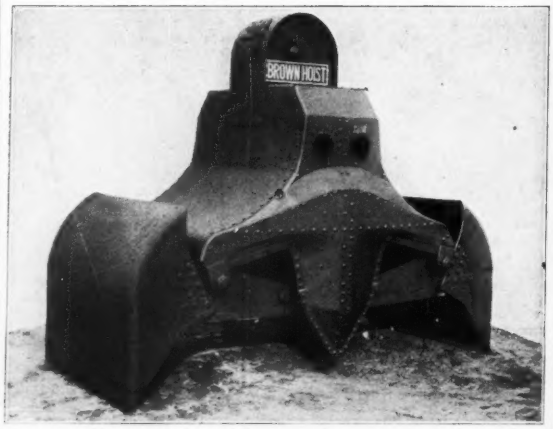

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You know what it is to have a lot of shovels, that ought to be in the hands of your laborers, out being sharpened. You know what it is to put a gang of men on a job and wonder why they don't remove as many cubic yards of dirt as you think they should. It is because the shovels they are using don't hold their sharp edge.

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Wyoming Shovels

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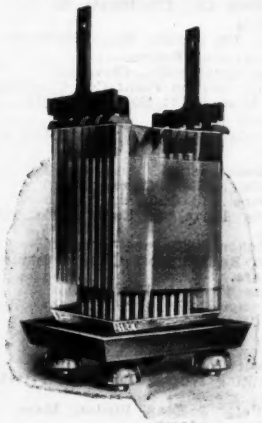
WYOMING SHOVELS really save their cost because with less men you can get more work.

We have an interesting booklet on shovel construction which you ought to read. Let us send it to you.

WYOMING SHOVEL WORKS

WYOMING, PA.

For Signal Service Employing Storage Batteries



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Our large variety of types and the elasticity of our design permits us to meet any service requirements.

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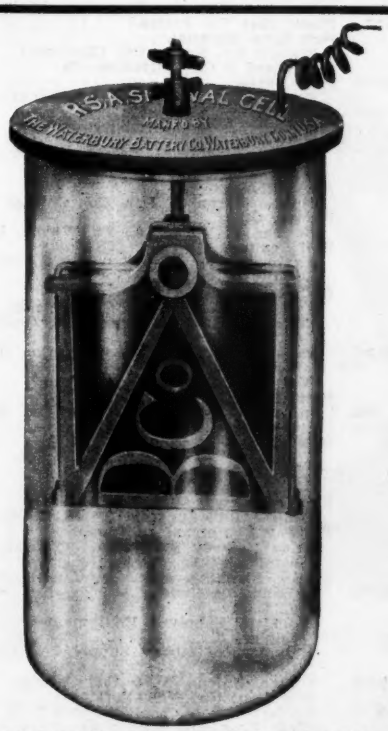

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is a result of the combination of

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And so it is. This conclusion is supported by service records. Why not prove it to your own satisfaction? Install some Schoenmehl batteries and let them show what they can do.

There is a clean saving from the very start; you will reduce maintenance costs to the minimum; and you will have the knowledge when using this type of cell that you have taken the very best step possible to secure efficiency in the operation of your signals.

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A Guarantee With Every Bucket

DOUD'S PATENT GRAB BUCKET
PATENTED OCT. 24, 1911.

The Doud Grab Bucket

Will dig harder material than any other clam-shell bucket made!

WHY?

Because it is reaved different than any other bucket made, and it is reaved right.

Here is what one contractor says:

"We consider its digging qualities *SUPERIOR* to any of the other makes of clam-shell buckets that we have, which include three other well known types."

Here is what another railroad contractor says:

"The 1-yd. Clam-Shell purchased of you is giving entire satisfaction. My superintendent reports that they brought up and landed a rock containing over 1 cu. yd., this being gripped by the teeth."

Not a Sheave or Line on This Bucket Touches the Material Being Handled

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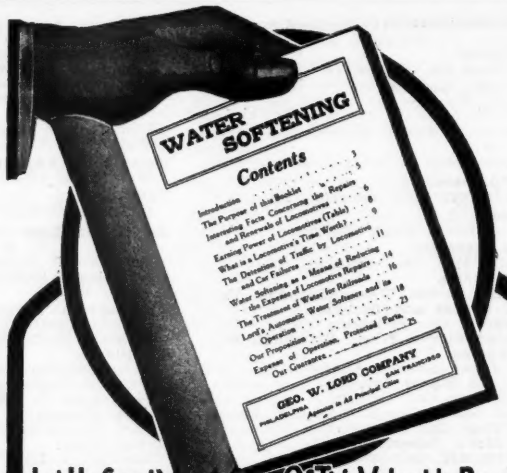
An installation of Water Softeners by one of our railway customers not only enabled it to increase its average freight train haul by 40% more cars but to make a saving of 15% in its fuel cost per train load mile over the previous year.

Over one-third more cars moved and 1600 tons less coal consumed in doing it should appeal forcibly to every railroad man whose locomotives traverse bad water districts.

Write us for a copy of the railroad report upon which the above statement is based.

American Water Softener Co.
1015 Chestnut Street, Philadelphia

"A laborer can operate the American"



Let Us Send You A Copy Of This Valuable Book

Every one of the articles in it are vitally important to you as a railroad man.
For instance: On Page 14 the chapter "Water Softening as a Means of Locomotive Repairs," explains how large a saving can be accomplished in just this one respect by a pure water supply.
Although every railroad man knows the value of pure water, there has always been one big objection to water softening systems, and that is their excessive first cost.
This objection has been overcome in

LORD'S WATER SOFTENING APPARATUS

This apparatus is far more reasonable in first cost than any other and its efficiency and economy are guaranteed by the success of the many installations we now have in use.
In most cases we have improved conditions to such an extent that the saving practically paid for the purifying apparatus in a short time.
To help you find out just what you can save, we want you to let our chemists make a free analysis of the water you must use. After that we can tell you exactly what we would suggest—what it would cost and what you can save.

Send us a gallon sample of your water.
It will pay you to do it now.

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Indestructible Paints
Used satisfactorily by several roads—
The kind you will eventually use.
Moore Mica Paint Company
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Automatic Safety Switch Stands Are Manufactured Only by the RAMAPO IRON WORKS

Write for descriptive catalogues on **Switch Stands, Switches, Frogs, Guard Rail Clamps, Etc.**

Manganese Track Work a Specialty

RAMAPO IRON WORKS

Main Office: Hillburn, N. Y.
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NON-CORROSIVE wooden water pipe is manufactured by The Michigan Pipe Co.

The pipe is steel banded, as shown. The steel bands are protected by a coat of imperishable asphaltum cement. The pipe is strong as steel with the resiliency of wood.

Some advantages of "Michigan Wood and Steel Pipe:

Will not corrode. — Protects water from freezing. — Less friction than metal pipe. — Withstands vibration without loosening the joints. — Withstands water hammer without bursting. — Withstands Hydraulic Pressure of 200 lbs. per sq. inch.

Many other advantages explained in our catalogue—write for it.

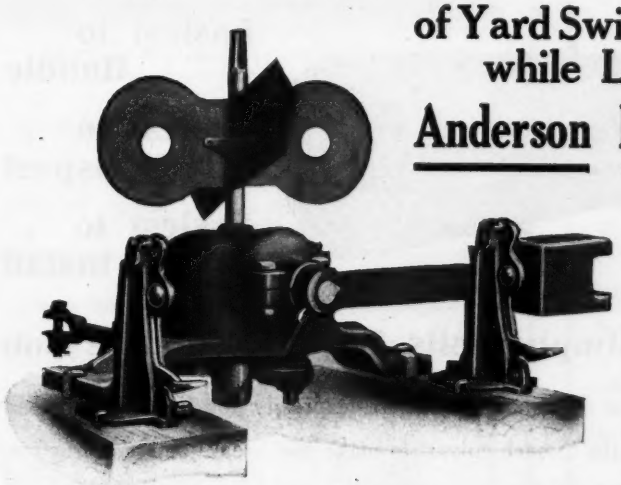
This pipe **lasts indefinitely,** and can be made as **strong as desired.**

THE MICHIGAN PIPE CO., Bay City, Michigan

16⅔ CENTS Maximum Maintenance Cost

of Yard Switches that are Run Through while Latched if you use the

Anderson Economy Switch Stand



This stand for yard switches, is provided with a special 3 way crank arm made of malleable iron. This 3 way crank arm is designed that when switch is run through, one of the arms to which the switch is connected will shear off, without damage, to any part of the switch mechanism.

The switch can be quickly placed in order by connecting the rod to one of the other arms. When the three arms are destroyed a new three way crank can be applied. These are furnished at 50 cents each. This feature is not new.

Over 30,000 Economy switch stands with this special 3 way crank, in service on many railroads.

Nonbreakable cranks are furnished for main line switches.

Full Details and Description of This Switch Stand in Our Catalogue. Write for It

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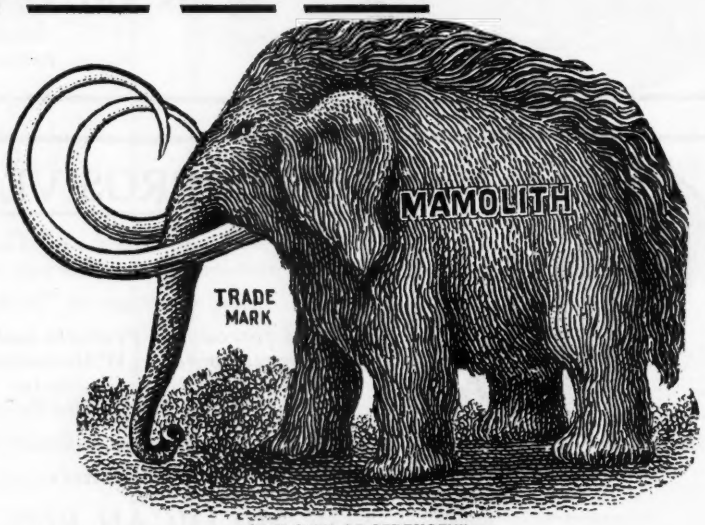
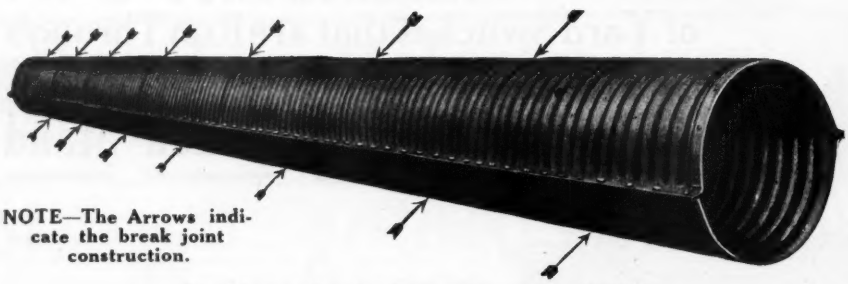


"THE SIGN OF STRENGTH"

McMartin Sectional Culverts

The Knock-Down Nestable Kind



NOTE—The Arrows indicate the break joint construction.

Easiest to Handle

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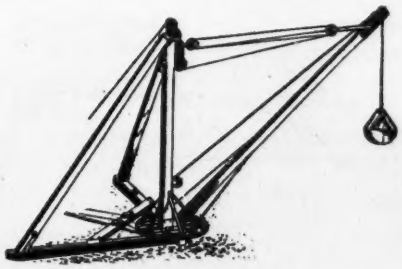
Manufactured under Letters Patent No. 999390.

Nests for Shipment and Simply Bolts Together on the Job

The Iron used is the renowned Iosa Metal manufactured expressly for Culvert purposes.
Made in 48" lengths with two half lengths to each culvert to make the break-joint construction.
The great strength is due to the reinforced flange-joint and the break joint construction.
Ends reinforced by half oval galvanived iron bands.
Used by many of the largest railway systems.

Duluth Corrugating & Roofing Co., Duluth, Minn.

Hoisting Machinery



We can furnish machinery which will absolutely fulfill your requirements, at minimum cost. :: :: ::

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17 Gull Street **BUFFALO, N. Y.**

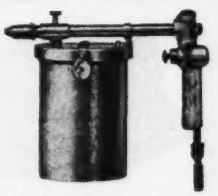
"The Only Real Machine for Laying Track"

It hauls the material train with its own power.
It automatically distributes material in position on the roadbed.
It does all the lifting and carrying of rails and ties.
It requires 25 to 50 per cent less labor than any other method.
It always full-ties the track—no matter how fast it is laid.

Our booklet illustrates and explains these facts—send for it.

HURLEY TRACK LAYING MACHINE COMPANY
343 S. Dearborn St., Chicago.

Use the Buffalo Air Brush



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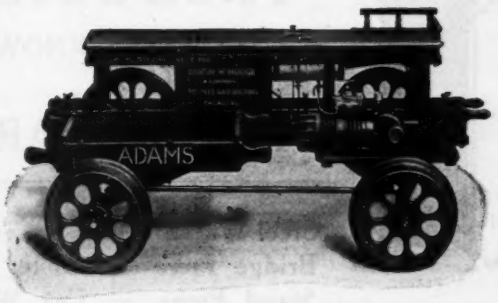
The Car That's Easy to Buy Is Easy to Operate



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Now is the season when a Motor Car is needed most

This car will be shipped to you for *immediate* use and you may pay for it while using it, by your choice of any one of several easy monthly payment plans.

The Mudge-Adams is the *lightest four horse-power* car made *and weighs less* than most cars developing *only two horse-power*. Every working part is easily accessible and it is so simple that it is practically *trouble proof*.

One man can handle this car on and off the rails (*in four seconds*), and it will carry three men, tools and supplies.

All the features of the car and its specifications are contained in our new circular. Your copy is ready to be mailed—send for it TO-DAY.

Burton W. Mudge & Company
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Send me your circular and also your monthly payment plans that make the Mudge-Adams "The Car That's Easy to Buy." I want to be posted on up-to-date Motor Car possibilities.

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*R.R.*_____

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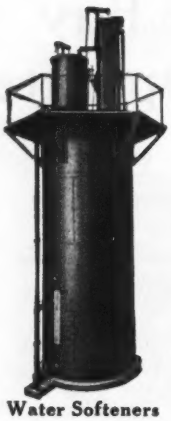
STEEL TANKS AND PLATE WORK

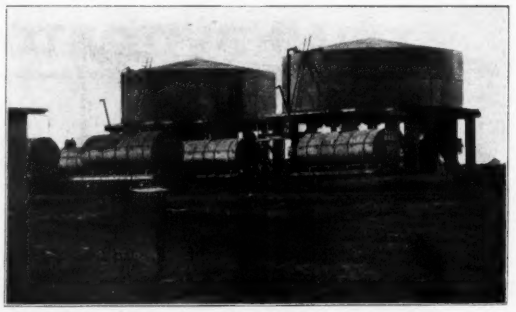


Water Softeners

GRAVER PRODUCTS

FAVORABLY KNOWN FOR

FORTY YEARS



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THE BARTLETT-GRAVER WATER SOFTENER HAS NO EQUAL

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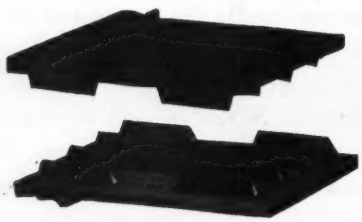
ATLAS RAIL JOINTS, TIE PLATES AND BRACES

ATLAS SWITCH STANDS AND CAR MOVERS



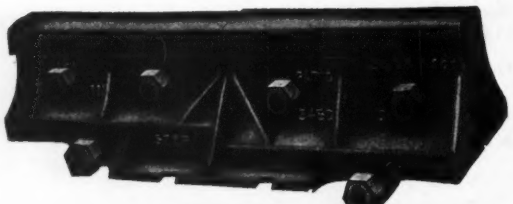
Top and Bottom View of Atlas Tie Plate

Atlas Primer and Surfacer for Your Cars

Atlas Standard Suspended Joint

Atlas Compromise and Insulated Joints

Made either of Atlas Special Malleable Iron or of High Grade CAST STEEL



Atlas Compromise or Step Joint
Made to Fit any Combination of Rails, Tee or Girder.

Made Either Suspended or Supported.

Atlas Insulated Joint

ATLAS RAILWAY SUPPLY COMPANY, - 1523-7 Manhattan Building CHICAGO
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Write for Circular "M"

RAILWAY ENGINEERING AND MAINTENANCE OF WAY.

WITH WHICH IS INCORPORATED
ROADMASTER AND FOREMAN

BRIDGES—BUILDINGS—CONTRACTING—SIGNALING—TRACK

Published by THE RAILWAY LIST COMPANY

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CONTENTS.

Labor in England and America.

SOME very pertinent causes of labor unrest in England and its colonies are cited in a paper by John B. C. Kershaw in the Engineering Magazine. It is interesting to note that the conditions and causes of the labor dissatisfaction are very similar to those which hold in the United States. The first cause given is "the increased cost of food and the rising standard of comfort and luxury demanded by the workers." Official figures show that the cost of living has increased 10 per cent since 1900, and 20 per cent since 1893. The increase in price of food in the United States has been much greater than this. We have to combat this same condition but in a more acute degree.

Another cause given is the increasing amount of laborers temporarily employed, or those who have no steady vocation. In this country we are fast working toward producing a similar class of people. The number of men who are employed only on temporary work is becoming larger yearly. The railways are perhaps the most serious offenders in this respect. Thousands of men are employed temporarily on maintenance or construction in the summer months, and discharged in cold weather. When business is good and receipts are high, an exceptional amount of construction will be attempted. All the railways will be in the market for large numbers of laborers. Consequently the demand is much greater than the supply, and the result is very much higher construction cost.

If the amount of construction done each year were regulated by the rules of common sense, and according to the wishes of the engineering departments, practically a uniform amount of work would be done each year. The result would be a construction department of much greater efficiency.

Suppose, for instance, that an exceptionally good gang of foreigners is gotten together during the season. If this gang could be kept on pay during the entire winter a large "organizing expense" would be saved the next year. And in addition you would have a good gang of men, which is not a very common occurrence. This system would also give a reward to the industrious and willing laborer. Under the present system, as ordinarily practiced, there is no reward for a laborer who shows exceptional ability. Neither does he get increased pay or a more permanent job.

From time to time in the winter it is necessary to hire large gangs of men for shoveling snow, in the northern and central states. Here is a place where the permanent extra gang could be used to advantage. And there are many other places where they could be profitably utilized. A particular case in which profitable work could be done is the distribution of material for the next year's work.

One winter the ice was allowed to accumulate around a large shop building layout. No attention was paid to this until a man slipped and broke his leg. Then orders came to hire a large number of men to clean up the shop grounds wherever it was necessary for workmen to travel. A gang of considerably over a hundred men was immediately hired and the work done. The men were green, the work was known to be transient, and the cost was high. The railway probably had to pay heavy damages to the injured laborer, for a casual inspection showed dangerous conditions. And

the railway admitted it by ordering the ice cleared. A permanent extra gang (floating gang would describe it better) could have done some valuable work there, kept the grounds in good condition and probably have saved the company enough money on that one job to make the payroll for several weeks besides preventing the accident.

It could hardly be expected that the floating gang would be kept on full time. A reduction to eight or even seven hours a day with corresponding pay would serve to hold the gang together, and the right kind of a gang of men would appreciate it and make much money for the company when work is in full blast. We would not advocate such treatment for a poor gang of men. The sooner such a gang is laid off, the better it is for the company, for the example set by a poor gang will spoil a good gang.

That a great saving results from doing construction in slack times was proven on a job of track elevation. The estimate, based on work during several years previous, was approximately $200,000. The work was done in 1907 at a cost of only $150,000 (approximately). Work was scarce and labor plentiful, and that explanation accounted entirely for the good showing made. Good men were plentiful that year, and several gangs could probably have been retained for future work with excellent results, but the company's policy did not permit.

The article referred to above touches on the question of Labor Unions, saying: "The general strike has been substituted for the older and more cautious methods of trade union warfare, and there is an increasing lack of discipline and self restraint shown by the younger generation of workingmen."

It is undoubtedly true that unorganized labor is not getting its due. It is at the mercy of organized labor. The unions demand and receive higher wages. The railways are forced, by reason of restricted revenues, to refuse unorganized labor its due. Thus the railways are put in the anomalous position of encouraging organization among workmen. It is easy to forecast the ultimate result if conditions remain unchanged. It also appears that the more aggressive unions are the ones which get increased wages. Demands seem to be more effective than appeals

Strikes are becoming daily occurrences, to the great inconvenience of the public generally. Would not a law compelling unions and employers to submit all disputes to arbitration be a step in the right direction? A fair board of arbitration would consider not only the claims of organized labor, but the claims of unorganized labor, which might be deprived of a proper income to supply the exorbitant demands of organized labor.

That business conditions have not been all that could be desired in England is shown by the statement of another cause of labor unrest: "The distrust produced in the minds of capitalists and manufacturers by the tendency of recent British legislation and the consequent flow of new capital into other channels of British industry." This seems to be an exact parallel condition to that which has until quite recently applied to the railway field alone, in the United States.

Restrictions have caused decreased earnings, and fear of still harder conditions has tended to drive capital into other channels, where the dividends are felt to be more certain.

The railways hesitate to put forth large bond issues unless the market is receptive and it is known that the bonds will bring a reasonable price. So they have gone on curtailing expenses, improvements, and extensions with the result that the facilities will not be equal to the demands of a prosperity approaching that previous to 1907. The result will be a future demand for railway services entirely beyond the present roadway and equipment, inducing a demand for labor which will put it at a still greater premium.

A comparison of labor conditions in England and America seems to show that there are world-wide causes for labor unrest, and that while local remedies may be applied to ameliorate conditions, the final remedy must be universal in application.

On Trial.

A MAN who is prominent in the railway supply field and who has by his good judgment and ability brought his concern from the weakness in which he found it, to a strength and solidity seldom equalled among those manufacturing railway equipment, recently stated that he allowed nothing to go out "on trial." A gasoline section car happens to be one of the articles manufactured by his company. Owing to the considerable cost of equipping a railway with power cars, and to the fact that the use of motor cars are still regarded by some engineers as experimental, this company is frequently asked to place cars in service on trial. The point made by the man in question is this: A railway cannot, in the nature of things, give a square deal to a device accepted "on trial," no matter what the attitude of the department heads may be. The men speedily become aware of the experimental situation and human nature is such that there is immediately sown the germ of prejudice.

Even officers grow to show slight respect for the device offered without cost and for the concern which makes the offer. This is true regardless of the fact that the spirit in which the offer is made, is recognized and understood by the recipient.

A concern should not place and keep in experimental service devices which it is reasonably sure will make good. A concern which intends to lay claim to a reputation for reliability will do its own experimenting and, when satisfied, will place the device before the railway on the solid basis of a straight sale. There is no practical difference between an "on trial" proposition and a guarantee, except that in one case there is no immediate sale arranged and in the other there is. If a railway stands to lose through the purchase of equipment on account of defects, it should purchase equipment elsewhere, for the selling concern which expects to continue in good standing will make good if the equipment does not.

Of course new inventions must be thoroughly tried out. It is not argued that railways should not assist in the development of improvements by experimentation, under the nursing of the inventor or owner. When, however, the improvement in question has been perfected to the extent that a reliable concern offers it for sale, the request that it be placed in service "on trial" in order that the officers of that particular road may commence the experiments all over again for their own satisfaction, is unfair. Such methods do not tend to build upon a solid basis and are not productive of a square deal for the railway official, the supply concern or the device itself.

Necessary vs. Desirable Work.

THERE is room for the use of a great deal of judgment in track maintenance at all times, but especially is this true just after the frost has gone out of the ground. There are a thousand and one things that should be done. The present forces are generally insufficient, and even if they were sufficient in the long run, there are times when the amount of work seems to get beyond the ordinary capacity of the section forces.

Here is a chance for a man to display his judgment. He must differentiate between that which *must* be done and that which it is desirable *should be* done. This is a condition which must be faced not only in track maintenance, but in nearly all modern business. There is a fluctuating demand on the resources of most men holding responsible positions. The extreme demand must be met by postponing those things which should be done but are not absolutely imperative and doing only those things which are vitally necessary. The other work not absolutely necessary at a given time can be taken care of at a later date, but, of course, it should never be forgotten.

When going over a section in the spring there will be a number of places which need immediate attention. Your bridge approaches may be badly out of surface. Short stretches of track may be badly out of line. It is a good foreman who will remedy these places and know where to stop.

After raising the bridge approach, the track back of it will look rough by comparison and the chances are that the foreman will continue along, improving track that rides pretty fair, and leaving other spots which are in much worse shape. This tendency is only natural, but it is not good practice. The trouble is that the track just raised looks better than adjacent track. In order to cover the largest amount of necessary work, it is good practice for the foreman to go ahead and mark the very worst spots, putting a chalk mark at either end of the place requiring attention. After he has decided these places, by comparison with the general condition of the track, he must stick to his original judgment and give only those places his immedate attention.

If the section gang is of good size and there is a competent man to act as straw boss, the problem is simplified. The foreman can give his entire attention to carefully spotting out the worst places in the track, giving his assistant strict orders to touch no parts of the track except those marked.

If the gang is very small and there is no straw boss, the foreman will have to walk ahead of his gang, leaving them to center tamp and dress up track. He will not be able to pick out the bad places as carefully, and probably the men left behind will not accomplish nearly so much work as if he were with them.

The Roadmaster, of course, will help out the foreman by making note of the worst places in the track as he rides over it. He can then give the foreman the information, which will help to put his track into fair shape quickly.

By paying careful attention to the work, and going over the track and improving the bad holes only, a quick and very noticeable improvement may be made in its riding quality.

Track which is not level, especially if it be alternately low on opposite sides, makes very rough riding, so a level should always be used in locating and raising the rough spots. Track which is comparatively rough will ride pretty well if it is level.

NEW LINE ACROSS ANDES.

According to consular reports, the Peruvian Congress has passed a bill for construction of the Ucayali Railroad, which will connect the most easterly railway head in Peru with Amazon River navigation. The line will extend 270 miles from Goyllarisquisca, terminus of the Cerro de Pasco Railroad, in the port of Pucalpa, on the Ucayali River. The route will follow the Huallaga River, crossing the mountains which separate it from the Ucayali River, and will cross the extensive Sacramento pampa.

It is planned to run 2,000-ton steamers from Pulcalpa to Iquitos, where connection will be made with ocean-going vessels. Steamboats are now operating from Pucalpa 300 miles south on the Ucayali River. Huanuco, 6,000 feet above sea level and with 10,000 population, is the largest city en route.

By the concession, which needs only the signature of the President to become effective, the Peruvian Government will issue $10,000,000 in bonds, payable in installments with the completion of each 25 miles of the road, to the Amazon & Pacific Railway Co., a corporation organized in New Jersey. The bonds will bear 6 per cent interest, with 1 per cent for a sinking fund, and are to be secured by the tobacco tax. The concession includes the right to extend the railroad 190 miles from Cerro de Pasco to the Pacific coast, and upon its completion a further payment of $2,500,000 in Peruvian bonds is to be made. Five years are allowed for construction of both branches, which are to become Government property after the concessionaire has operated them for 25 years. In addition to the bonds mentioned Peru is to convey 5,000,000 acres of land, the title to which becomes accomplished when the President approves the bill, the concessionaire, A. W. McCune, having already deposited $150,000 as security for the execution of the contract.

Speaking of the country through which the road would pass, Mr. McCune said that the Sacramento pampa contains 80,000 square miles and is the largest in the world. The engineers who surveyed the road, he said, were the first of the white race known to have crossed the vast plain, which they found inhabited by about 250,000 people.

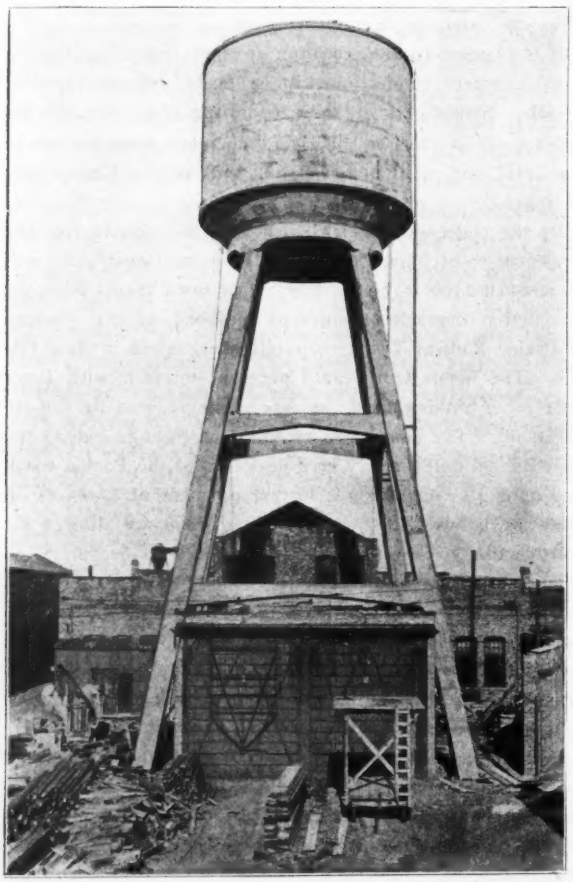
Along the line of the Queen & Crescent through Kentucky and Tennessee, the old fencing, wood posts and wire netting, is being replaced by new steel fence supported on concrete posts. The expense incidental to a complete renewal of all posts was hardly justifiable in view of the excellent condition of a majority of the posts and renewal has been made only at the corners and every fourth or fifth post. This has given perfect support for the new steel fence and yet has made the present cost of renewal moderate. It will be possible to make further renewals as necessary. The posts are made under factory conditions at one point on the line and shipped as needed to the various points of re-construction.

CONCRETE WATER TANK.

The Chicago City Railways recently finished a concrete tank at the 78th street plant, Chicago, which has some interesting features. The purpose of the tank is to supply pressure for sprinkling and fire protection. The specified capacity was 100,000 gallons, but the tank as constructed has a total capacity of 120,000 gallons.

The desired location of the tank was occupied by a large brick building which it was thought inadvisable to tear down or move. The supporting columns had to be designed with enough spread to entirely clear the building. The columns have an incline equal to 14 ft. in 46 ft., or a little less than one-third. This feature added considerable difficulty in design and construction.

There are four foundations, one under each column. Each



Concrete Water Tank with Inclined Column Supports.

footing is 11 feet square at the bottom, giving a total bearing area of 484 sq. ft. The bottom of this footing is reinforced in each direction by eight ⅝-in. round bars, each 10 ft. 10 ins. long. This reinforcement makes it possible to make the concrete footing rather thin, and to slope it off rapidly to the top. To secure a good bond between footing columns, four ¼-in. square rods 18 ft. long, bent double, were used. These wer anchored in the footing as shown, and help to resist the shear caused by the column pressure not being transmitted vertically.

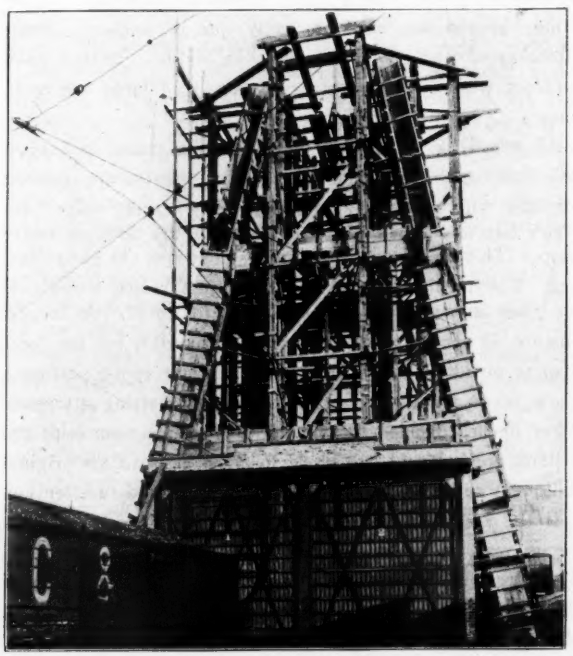
The columns are 30 inches square, being designed thicker because there is no diagonal bracing. Four bars compose the reinforcement in each column, each 1⅛ in. square and 31 ft. long. These bars are overlapped 5 ft. where spliced.

The horizontal braces are rather heavily reinforced. At the joint with the columns, these braces are subject to a large bending moment on account of wind pressure. The loops shown at this joint are inserted to prevent the reinforcing rods from pulling out of the concrete when subjected to great stress.

The bottom of the tank is curved upward, and when filled with water, a pressure is developed which is counterbalanced by the downward weight of the walls of the tank. These stresses produce tensions which are taken care of by the large number of ⅝-in. square rods shown. The side walls are made 8 inches thick, and are reinforced by hoops, of the dimensions shown in the elevation, with 4-ft. laps. The roof of the tank is 4 in. thick, although 2 in. would probably suffice. It was thought advisable however to add the extra 2 in. for safety. The top is reinforced by a grid of iron rods at right angles.

The excavation was specified to be carried down 5 ft., but in order to get a good bearing this was increased, and the excavations were made from 7 to 10 feet deep.

The concrete for footings was mixed in the proportion of 1:2:4, using crushed stone. The mixture used in the remainder of the structure was 1:1:2. The sand was clean and well graded torpedo sand, and the stone varied from ¼ to 1 inch in size. The concrete was mixed in a batch mixer, and



View Showing Method of Filling the Column Forms.

was made wet enough to flow freely around the reinforcement and to fill out all the corners in the forms.

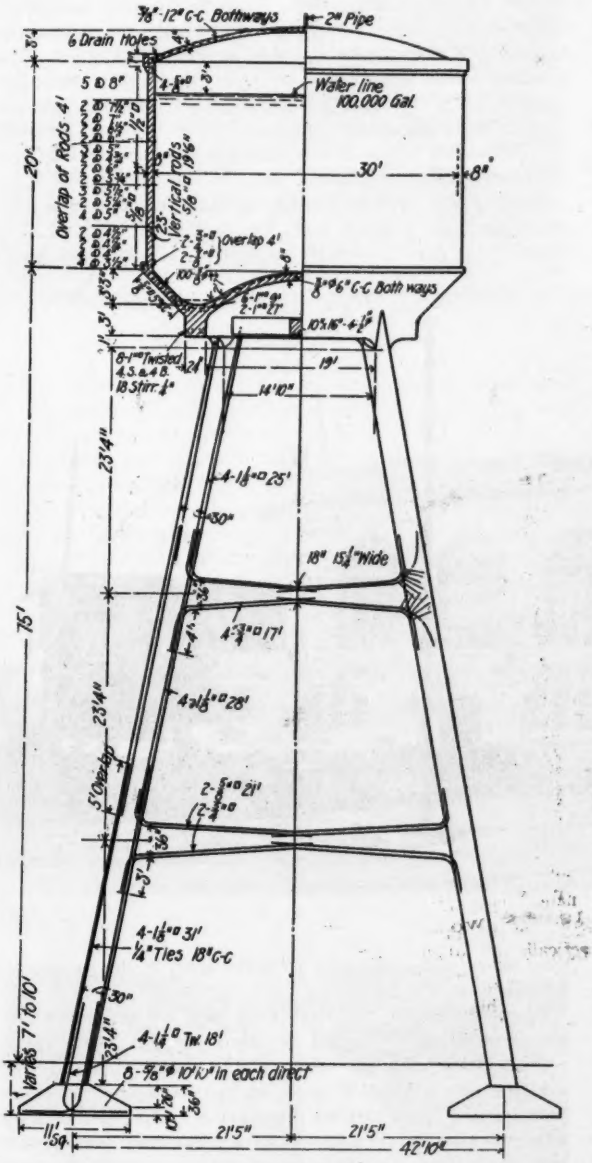
Before concreting was started, the forms were thoroughly cleaned, and inspected to see that the reinforcement was properly placed. When concreting after a suspension of only one day, the joints were thoroughly cleaned, drenched with water and then covered with grout. When work was suspended for a longer period, from ½ to 1 inch of the old concrete was removed before wetting and grouting.

The inside of the tank, when completed, was given 3 coats of cement from ⅛ to ¼ inch thick. The surface was previously roughened to insure a good bond. The cement finish was a mixture of 1 part cement, 1/10 part hydrated lime, and 1 part sand.

In freezing weather above 20 deg., concreting was allowed using heated water, gravel and sand, and forms were covered by tarpaulins under which steam from the company's plant was circulated.

The reinforcement used was high carbon steel with an ultimate strength of 90,000 lbs. per sq. in.

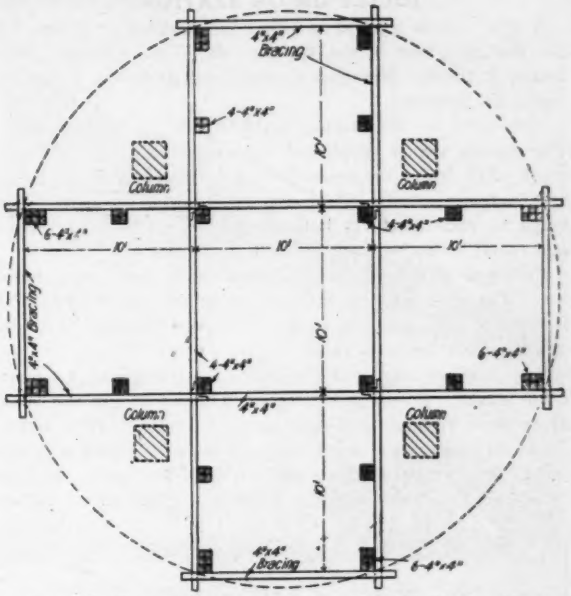
The form work was carefully designed to support the wet concrete without deflection. Forms were built practically watertight. The boards for the columns and girders were



Detail of Tank.

planed on one side and two edges, and the boards for the tank form proper were matched and dressed.

The shape of the temporary tower is shown in the accompanying diagram. The peculiar shape was used so as not to interfere with the columns, which it is noted are entirely outside the tower. The pressure from the tower had to be carried to and distributed uniformly on the walls of the brick building (dry kiln). The entire weight of the tank was carried by this tower during construction. The pouring of the concrete was very difficult in the inclined columns. The columns were carried up to the first girder in one

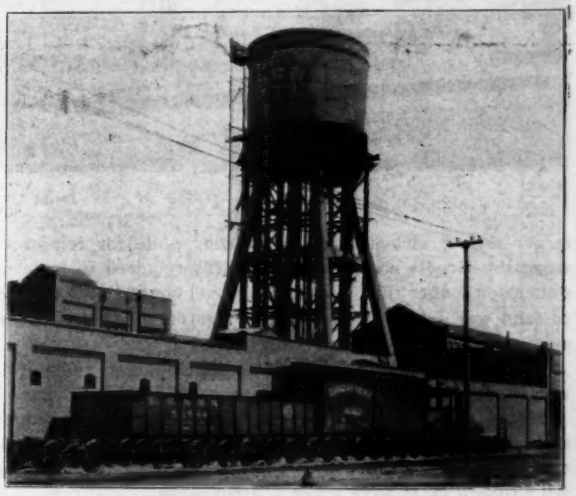


Cross Section of Temporary Tower Used in Construction.

operation. The girders were then poured, and after that a second section of the columns, and so on. The tank was carried up in 4-foot sections.

No waterproofing was used. The Railway Company had much faith in the ability of the concrete water tank to hold water, as was evidenced by its location over a dry kiln. However, the contractor was required to guarantee that the tank would be watertight, and that any defects appearing within a year would be repaired.

The tank was designed and constructed by L. J. Mensch, 138 North La Salle street, Chicago. The work was done under the supervision of Hugo Schmidt, architect for the Chicago City Railways.



View of Tank Before Forms Were All Removed.

Jacobs & Davies, consulting engineers, New York, have opened an office at 263 St. James street, Montreal, Que., under the management of Paul Seurot, their Canadian representative. This firm has specialized in subaqueous tunnel construction and among other work, built the tunnels under the Hudson river for the extension of the Pennsylvania into New York City, and also the Hudson & Manhattan tunnels at New York.

JOLIET UNION STATION.

A new Union Station is being constructed at Joliet, Ill., for the joint use of the Chicago & Alton, Chicago, Rock Island & Pacific, Michigan Central, and Atchison, Topeka & Santa Fe Railways.

The walls of the station building are of Bedford stone. The tracks are elevated and the second story is on track level. The lower or street level floor contains ticket offices and baggage rooms. Tunnels lead from this floor to stairways to each platform between tracks, so that passengers can reach trains without crossing any tracks.

Concrete was used very extensively in the station building. The roof is composed of a monolithic slab. The platforms are also concrete slabs. The pier foundations of the building rest on solid rock.

The footings were made of 1:2½:5 mixture and 1:2:4 was used for all reinforced concrete. The floors for the lower story were built on a 12-inch layer of cinders. Slow setting Portland cement was used, each 500 bbls. of which was subjected to chemical analysis and 7 and 28-day tests. In plain concrete, the crushed stone used was required to be not larger than 2 inches in any direction, while for reinforced work the largest coarse aggregate was required to have no dimension longer than 1 inch. In gravel concrete the amount of sand was determined accurately in order to show the correct proportions of the mixture.

The concrete was mixed with a batch mixer and put in wet enough so that little tamping was necessary.

Forms were of lumber dressed on one face and two edges, and were left in place at least 36 hours. All joints in the concrete were scrubbed with coarse wire brushes and water. All exposed faces were given a grout wash.

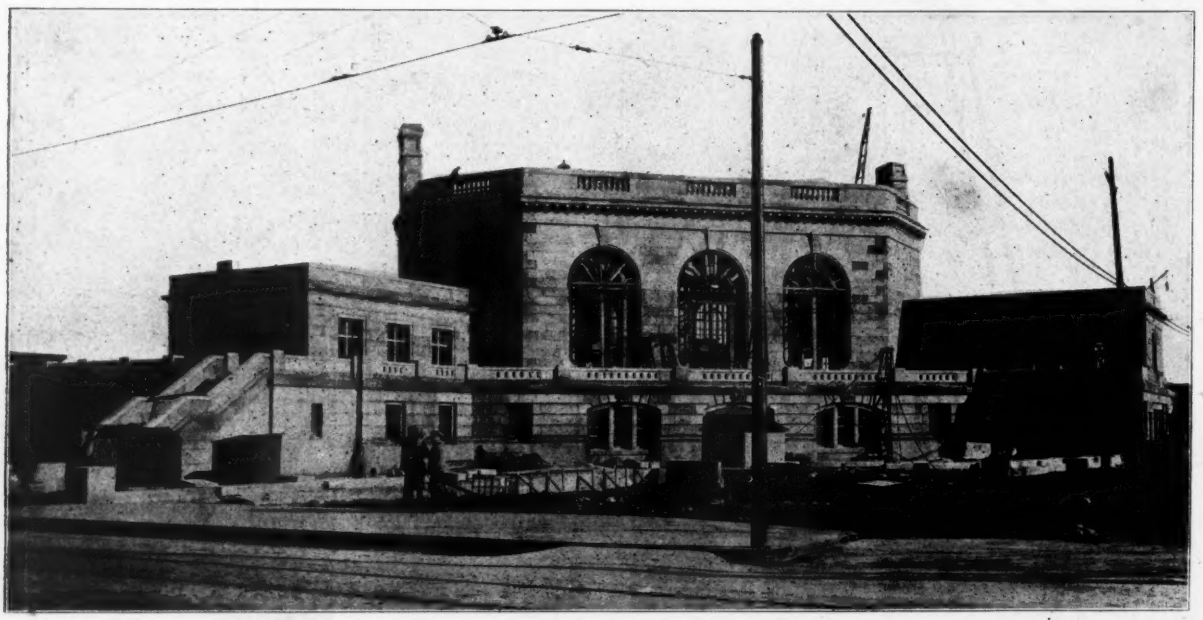
Floors, platforms and the station roof are reinforced concrete slabs on structural steel. The slabs were built continuously, starting at one end and carrying along the work to the other end. The reinforcement used was cold twisted square steel bars with elastic limit of 60,000 lbs. Reinforcement was required to be at least 3 inches from face of concrete in every case.

For concrete floors on earth, the ground was flooded, tamped and carefully leveled. A 12-inch layer of cinders was spread, and a 5-inch coat of concrete put down. A finish layer of cement plaster was put on top of this. The mixture used for the finish coat was a 1 to 1 mortar of cement and sand.

The roof slab is 4 inches thick, concrete-made 1:2:4 with washed gravel. After the concrete had set up two brush coats of ironite were put on for waterproofing. On top of this was a 2-inch layer of concrete or mortar, which was a mixture of coke breeze and cement proportioned 1 to 6.

The object of the coke breeze cement layer was to give a porous concrete into which nails could be driven. The nailing proved to be surprisingly easy. Copper nails were used, which of course would bend very easily. No trouble was experienced, however, and the nails hold as well as if driven in wood. This layer of porous cement was subjected to a rather severe test when the carpenters nailed lath on the top, within a half inch of the right angled edge. There was no cracking or crumbling. An ordinary slate roof was put on and gives an excellent roof both as to appearance, water tightness, and permanency.

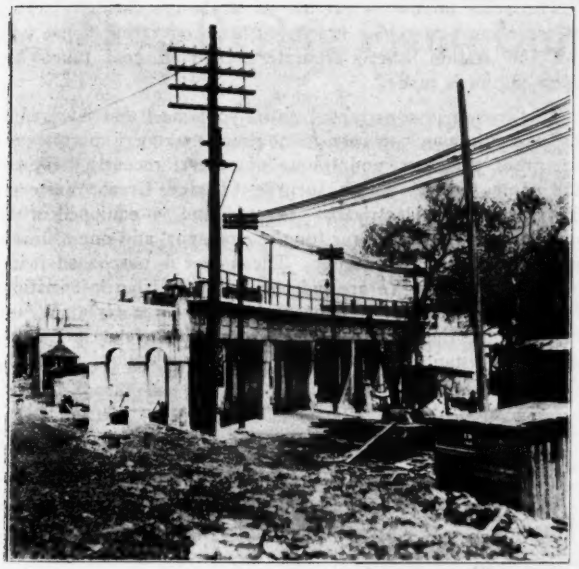
Concrete was used in making two large domes, rising from the roof of the wings to meet the main walls. The rib form timbers were cut into circular segments to which ⅞-inch boards were nailed. The ribs were 12 inches apart at the bottom, and converged at the top.



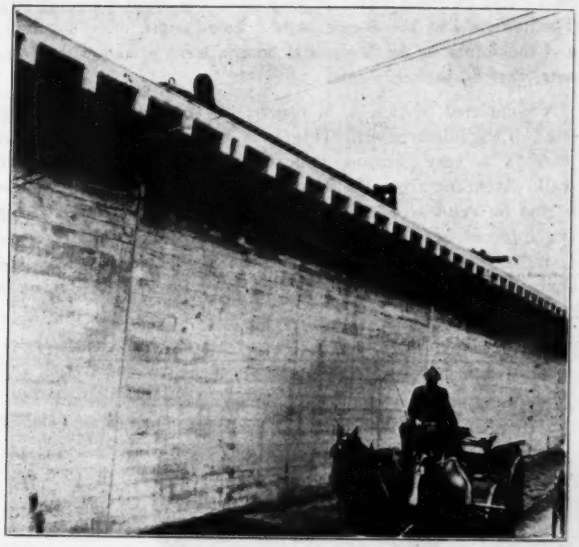
Joliet Union Station.

Practically all of the steel work was encased in concrete for fireproofing. The cost of forms for this work was, of course, rather high per cubic yard of concrete placed. The concrete is not handled easily in this work and the cost is high, but the result justifies the expense. Some of the girders which were encased in concrete, were 4 feet deep. On the track level floor alone, 300 yards of concrete was used in encasing beams and girders.

Excavation for the lower floor rooms was carried down into solid rock below water line. The specifications required that the walls and floors be absolutely watertight. The side walls were waterproofed as follows: First, a ⅛-inch hot Sarco mop applied with brush; on this a layer of open mesh burlap, placed and rubbed into the coat of Sarco while it was still hot; on top of the burlap a second layer of Sarco was mopped on hot. The burlap had a lap of 2 inches, and was converted to the damp proof wall course with a 2-inch lap. The floors were concrete, 10 inches thick. Ironite was used for waterproofing, and a 4-inch finished slab of cement mortar was put



Reinforced Concrete Wye Bridge.



Retaining Wall with Cantilever Passenger Platform.

on top. During the entire time this concreting was under way, it was necessary to keep a pump going continually, to keep the water down in the excavations.

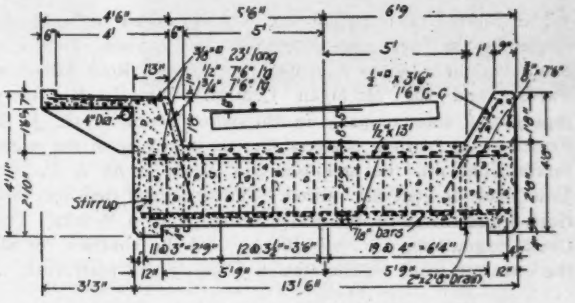
The train platform from this part of the building to the first track, forms the roof over the baggage rooms, etc., which are on street level. Consequently this slab had to be made exceptionally watertight. The concrete slab is 4 inches thick, on which two coats of ironite were applied. A finished slab of 3 inches of concrete was applied on the top.

The top coat of all platforms was made of a mortar of granite screenings, cement, and ironite. This surface was floated, but not trowelled, in order to leave a rough but level surface. This surface gives a much better footing for passengers. The granite and ironite mixture is used because it gives greater mechanical wear than ordinary concrete.

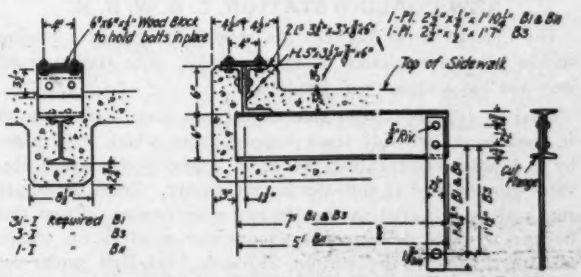
The train sheds (not yet erected) are to be waterproofed with Sarco and burlap, similar to other waterproofing described above. On top of the last coat of Sarco, neat cement will be spread, while the Sarco is still hot. Afterwards the surplus is to be swept off, leaving only that which is embedded or bonded to the coat.

The right-of-way for the Chicago, Rock Island & Pacific, and the Michigan Central, was rather narrow, and necessitated building the Washington street retaining wall close up to the track. An overhanging cantilever platform was extended out from the wall to provide the necessary passenger platform. An iron fence is to be erected at the edge of this wall. The wall is located on a curve. The details of the support for this walk are shown herewith. Six-inch I-beams were placed when constructing the wall, every 3 ft. On the wall end of these I-beams, a steel bar was riveted at right angles, and extended down into the concrete. These supports were placed when pouring the concrete in the wall forms. The supports for the fence posts were made by riveting an angle to each I-beam; to this angle two others were riveted to give the flat top surface as shown. The I-beams were encased with concrete as a protection and to improve the appearance.

Retaining Wall on 1° 6" Curve.



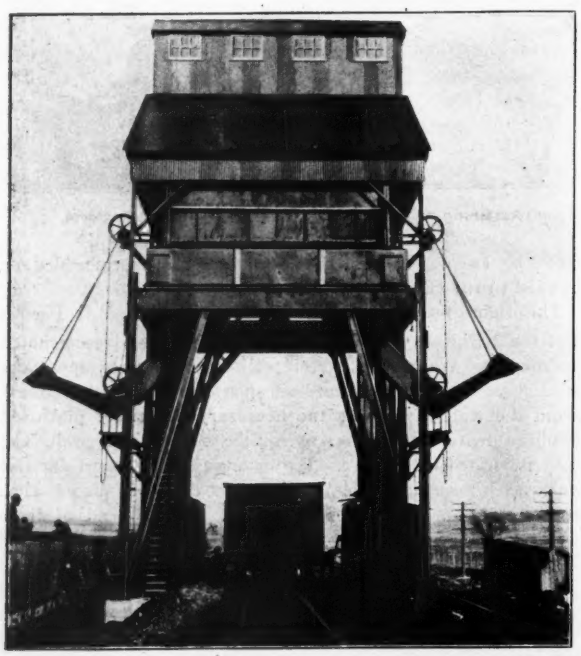
Cross Section of Wye Bridge with Cantilever Sidewalk.



Detail of Support for Overhanging Platform at Top of Retaining Wall.

On the opposite side of Washington street, the wall is located on a curve of about 1° 6'. A very good alignment was obtained. The uprights in the forms were located quite close together, and the joints in the horizontal boards were placed with alternate, that is, broken joints.

A completed portion of a concrete Wye bridge is shown in one of the illustrations. This is a reinforced structure, and presents a very pleasing appearance. There is a cantilever walk extending from the side of this structure, which is supported on reinforced struts. The sidewalk slab between struts is reinforced by ⅜-inch square rods, 23 ft. long. The concrete floor has been built with an elevation at the outer side of the curve, to provide elevation for the Wye track, which is on a sharp curve.



Coaling Station at Sycamore, C. G. W. R. R.

The Joliet Union Station Co. was organized to build the station by the four roads interested, the Atchison, Topeka & Santa Fe, the Chicago & Alton, the Chicago, Rock Island & Pacific, and the Michigan Central. Mr. J. B. Berry represented the company in the construction work, J. B. French being assistant engineer directly in charge of the work. Jarvis Hunt was the architect, and Adam Groth & Co., of Joliet, had the general contract. The structural steel was fabricated and raised by the Joliet Bridge & Iron Works. The Cook Engineering Co., of Chicago, had the contract for all the concrete work on the station building and platforms.

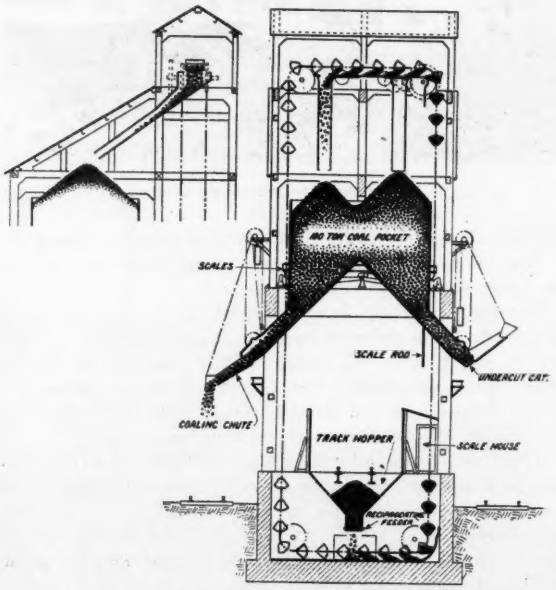
NEW COALING STATION, C. G. W. R. R.

The Chicago Great Western has recently completed a coaling station of modern design at Sycamore, Ill. The station is all steel and has a capacity of 100 tons.

Coal is delivered from side or bottom-dump cars to a 40 ft. long by 17 ft. wide track hopper, from which it is taken by a double reciprocating feeder to a gravity-discharge elevator-conveyor of 75 tons per hour capacity. From the upper run coal is delivered to the 100-ton scale hopper. From this hopper, coal is delivered to locomotive tenders on tracks at either side of the station, through Link-Belt under-cut gates and hooded chutes.

The scale hopper is carried on a 150-ton Straight scale. A recording scale beam is located in an operating house under the station where accurate record of coal taken by each engine is made.

The station is constructed entirely of steel and is carried on a continuous concrete foundation, making a permanent fire-proof structure, and is one of several recently built of the same general design for the Chicago Great Western. This station is electrically operated and is equipped with one 20 horse power motor for the conveyor, and one 5 horse power motor for the feeder. The power is purchased from a local company. We are indebted for the above information to L. C. Fritch, chief engineer of the Chicago Great Western, and the Link-Belt Co., Chicago, which designed and constructed the station.



Section Showing Operation of Sycamore Coaling Station.

The Chicago, Milwaukee & Puget Sound, it is reported, has plans under way for the new passenger depot on Pacific avenue, near 25th street, at Tacoma, Wash. It is stated that work will be started this summer. The cost is said to be $1,000,000.

The Delaware, Lackawanna & Western, it is said, will build a subway or undercrossing at Scranton, Pa. It will consist of a plate girder bridge, 50-ft. spans, carrying railroad bridge. The improvement will cost about $60,000.

The Kingston & Pembroke, which is controlled by the Canadian Pacific, will construct a new turntable at Kingston, Ont.

The Americus, Tifton & Atlantic, projecting a 110-mile line through Americus, Oakfield, Doles, Ashburn, Tipton, Nashville and Milltown, Ga., will have surveys made and will probably let construction contracts soon. The company will organize, as soon as it gets its charter. J. W. Myers, Tifton, Ga., is one of the promoters.

The Chesapeake & Ohio, it is said, will reconstruct 80 miles of the Big Sandy Division. Heavier rails and additional ballast will be laid on the line which runs into Elkhorn, Ky., toward which the Carolina, Clinchfield & Ohio is building a line from Dante.

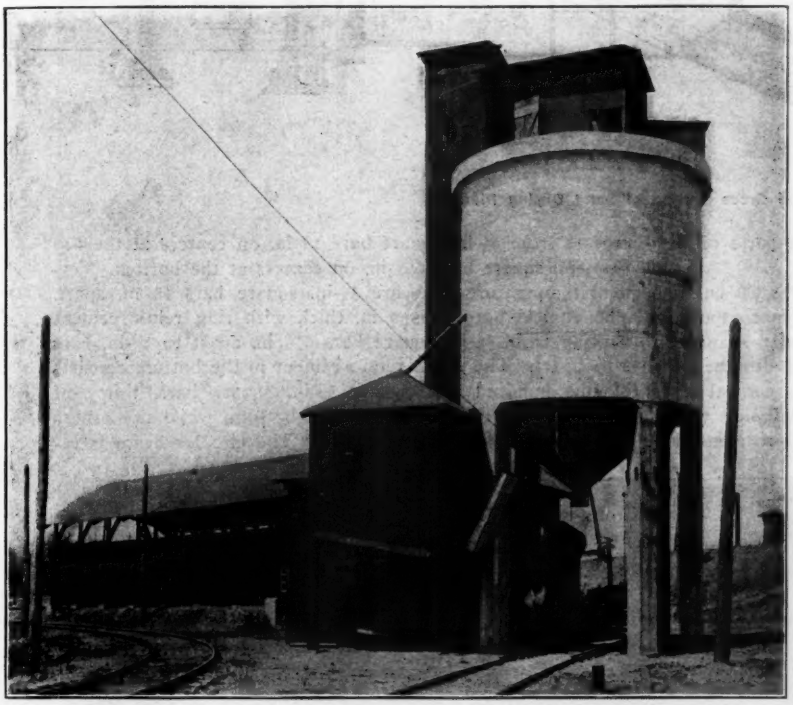
Culliton Bros., Spokane, Wash., have been awarded the contract for the grading and bridge work for the first 10 miles of the new extension of the Esquimalt & Nanaimo.

Sand-Drying Plant, United Railways of St. Louis*

By C. L. Hawkins.

The United Railways Company recently completed the construction of a new plant for drying the sand used in the boxes on the cars. The amount of sand used depends upon the condition of the rail and it is absolutely necessary that the sand be dry and free from gravel in order to flow freely from the boxes. The amount of sand used per month varies from about 300 cu. yd. during the dry summer months to 1,300 cu. yd. during the winter months, the total for the year being about 6,000 cu. yd. The sand used is ordinary Mississippi River bar sand and contains considerable gravel and from 3½ per cent to 5 per cent of moisture when it arrives at the drying plant.

The location selected was on a tract of land at the western city limits, where it was also proposed to locate a new supply yard suitable for handling all of the material required by the track department. This yard is on the south side of the inner belt line tracks of the Terminal Railway Association and the switching charge per car is three dollars less than at the Park and Vandeventer yard, which is located on the St. Louis and San Francisco railway tracks. As it was necessary to do quite a large amount of grading before the entire lot could be shaped for tracks, the sand plant was placed at the north end where very little track work was necessary to put this plant in operation and where valuable storage space was not utilized.



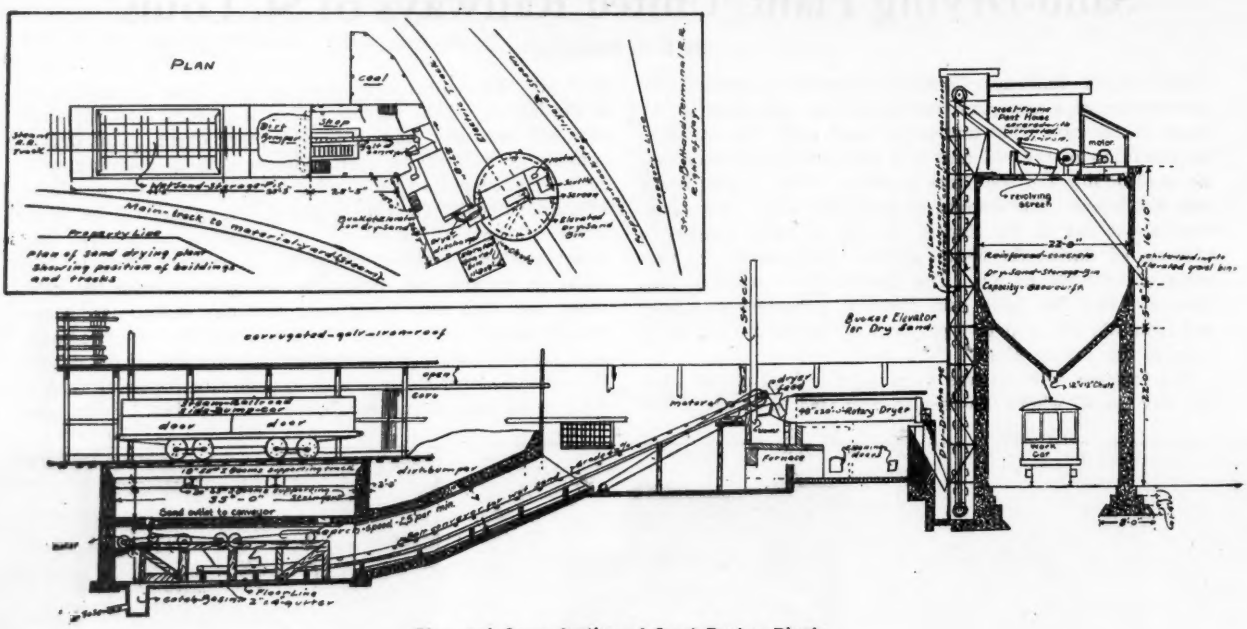
Completed Plant, Showing Elevated Dry Sand Bin and Gravel Bin.

Wet Sand Pit and Tunnel for Conveyor Belt.

The cross-section of the plant shows the course of the sand from the time it is dumped from the Union Sand Company's side-dump steam railway cars until it falls from the elevated bins into the work cars ready for the distributing bins. The wet sand is dumped directly into the wet sand pit. Two apron conveyors carry it from the openings in the bottom of the pit and deliver a uniform flow of sand to a belt conveyor leading to the rotary dryer. This dryer consists of a revolving steel cylinder 4 ft. in diameter and 20 ft. long, supported above a hand-fired furnace buring slack bituminous coal. The center line of this cylinder is set on a grade of about ½ in. per ft. The sand is received at the upper end and is tossed about by six curved lifting blades while an exhaust fan draws the hot gases around the cylinder and then into it through openings in the periphery, thus bringing the hot gases in direct contact with the sand as it travels toward the lower or discharge end of the dryer. A bucket elevator conveys the dry sand to a revolving screen located on top of the reinforced concrete bin. From this screen the sand falls directly into the bin and the gravel passes through a chute leading to an elevated gravel bin.

The wet sand pit was designed to hold about 3,000 cu. ft., or about two days' supply; 1,500 ft. of this will slide into the openings with little or no shoveling. The conveying machinery below required a space about 10 ft. wide, so the pit was made the same width, with the sides sloped back at the top to catch the sand as it falls from the side-dump cars. The floor of the pit is 13 in. thick and is reinforced with ¾-in. square rods 6 in. apart. The walls of the pit are 2 ft. thick and are not reinforced. The sloping sides were reinforced with ½-in. square rods 12 in. apart, more for use in case of derailment of cars than for sand loads, as the sides are supported by a dirt backing. The four sides of the tunnel leading from the machinery room were made 15 in. thick and reinforced with ¾-in. square rods 9 in. on centers. The dirt bumper on top of this tunnel is at the foot of a 2 per cent grade, 1,200 ft. long, and on account of the damage that might result from careless switching, the tunnel was made considerably stronger than the dead or live loads required. For temperature reinforcement

*From a paper read before the Engineers' Club of St. Louis and published in the Journal of the Associated Engineering Societies.



Plan and Cross Section of Sand Drying Plant.

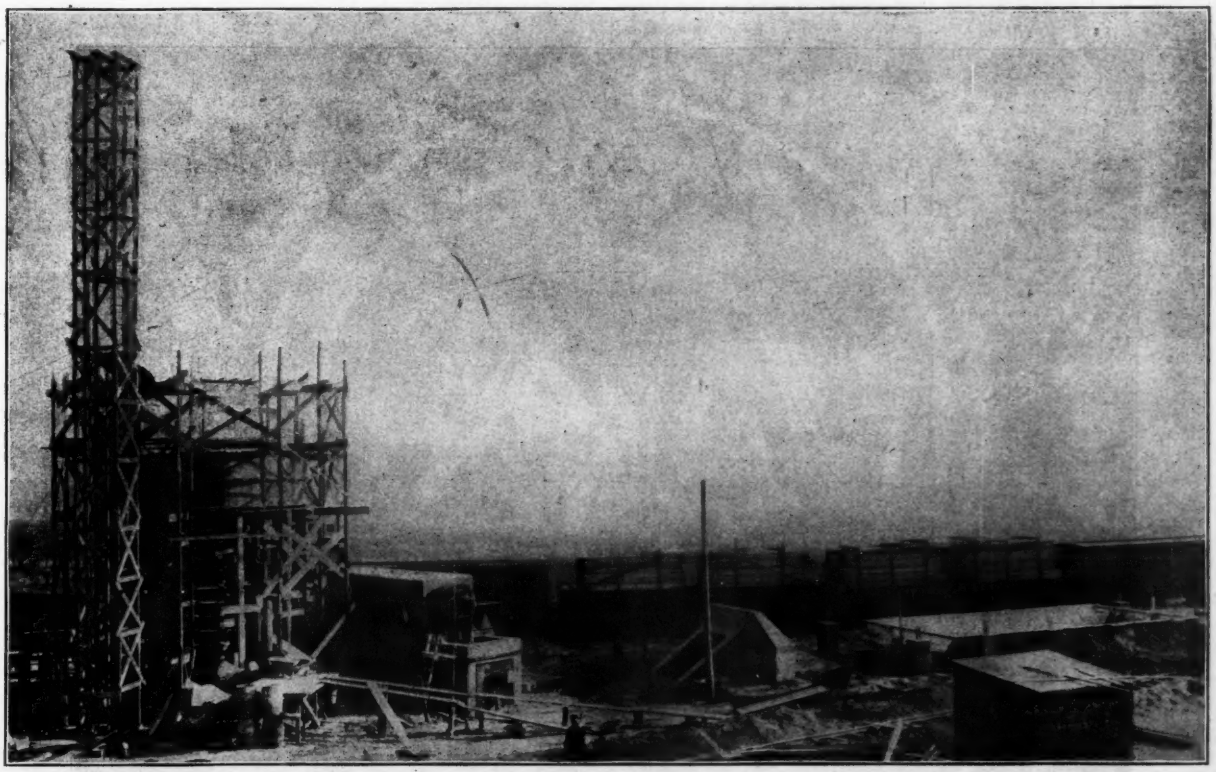
½-in. square bars were used in the reinforced parts of the pit and tunnel.

In the design of the dry sand bin holding 8,200 cu. ft., fluid pressure at 100 lb. per cu. ft. was used in computing the side and bottom reinforcement. The circular beam between the posts at the bottom of the bin was designed to hold four tenths of the total sand load, but the conical bottom was designed for full load. The vertical side walls of the bin are 7 in. thick, and the ring reinforcement increases from ⅜-in. square bars 12 in. on centers at the top to ¾-in. square bars 6½ in. on centers at the bottom. Vertical temperature rods are ½-in. square bars 18 in. apart. The conical bottom is 9 in. thick with ring reinforcement varying from ¾-in. square bars 6½ in. apart to ⅝-in. bars 9 in. apart. The radial reinforcement in the bottom consists of one hundred and twenty ¾-in. square bars, thirty of which run to the opening at the bottom, while the others stop at the ¼, ½ and ¾ points. The circular beam is re-

Wet Sand Conveyor Belt and Front of Rotary Dryer and Furnace.

inforced with eleven 1-in. square bars, seven of which are at the bottom. The roof was made 9 in. thick with reinforcement running both ways. The columns are 24 in. thick with ¼-in. square hoops 12 in. apart and eight ¾-in. square vertical bars; the opposite center bars are tied together with No. 12 wire and all vertical bars are imbedded about 40 diameters in the circular beam and also in the ring foundation.

All of the construction work was done by the building and mechanical departments of the company. Machine mixed gravel concrete of 1:2:4 mix was used where reinforcement was required and 1:3:5 for the plain concrete. The water for the concrete was supplied by a track sprinkling car equipped with an air compressor for lifting the water to the mixer.



Dry Sand Storage Bin, Rotary Dryer During Construction.

In the construction of the dry-sand bin the ring foundation was poured at one time, then the posts up to about the ¾ point. The inside and outside forms for the lower part of the circular bin, up to the 7-in. wall, were built on the ground in sections. After the entire lower or inside form had been placed, all of the rods, except those in the roof and the ring reinforcement in the 7-in. wall, were placed and securely fastened with wires or with nails and small concrete blocks. The inside form was then placed and anchored to prevent floating. After this section was concreted the side walls were poured in three sections, moving the same forms up about four feet each time. The roof and the last of these sections were poured at one time.

The gravel bin was built of wood, as was also the frame of the building surrounding the dryer and the wet-sand pit. The frame of the elevator tower and the screen house on top of the dry-sand bin were made of 3-in. by 3-in. by ⅜-in. angles. All of these buildings were covered with corrugated galvanized iron.

The conveying and screening machinery was furnished by the Link Belt Company. The two apron conveyors consist of 3/16-in. steel overlapping corrugated pans 9-in. pitch and 18 in. wide attached to a steel bar link chain supported on rollers. The 14-in. conveying belt is made of 4-ply rubber belting with 1/16-in. rubber covering and carries the sand up a 42 per cent grade very satisfactorily. The bucket elevator consists of 7-in. by 4½-in. by 4-in. malleable buckets 12 in. apart on a 4-ply rubber belt. The screen is 36 in. in diameter and 6 ft. long, with 3/16-in. openings between the wires in the covering. The conveyors, etc., are operated by four motors.

The cost of the buildings and machinery for this plant was approximately $14,000. The plant is operated by two or three men (from one of the car houses), depending on the condition of the sand; these men unload the cars, fire the furnace, watch the moving parts and keep them properly oiled, and keep the plant clean and in good order. On one of the first tests before the machinery speeds were properly adjusted the following results were obtained:

Moisture, 4 per cent.
Length of tests, 18.8 hr.
Cubic feet of sand dried, 2,650.
Pounds of coal used, 4,340.
Power used, 240 kw. hr.
Weight of water evaporated per pound of coal, 2.45 lb.
Tons of sand dried per hour, 7.05.
Tons of sand dried per ton of coal, 61.

Cost of operating machin'y per cu. ft. sand,	$0.0044
Cost of power per cu. ft. of sand,	0.0009
Cost of coal per cu. ft. of sand,	0.0016
Sand and freight per cu. ft. of sand,	0.0172
Interest, depreciation and taxes (12 per cent),	0.0104
Total,	$0.0345

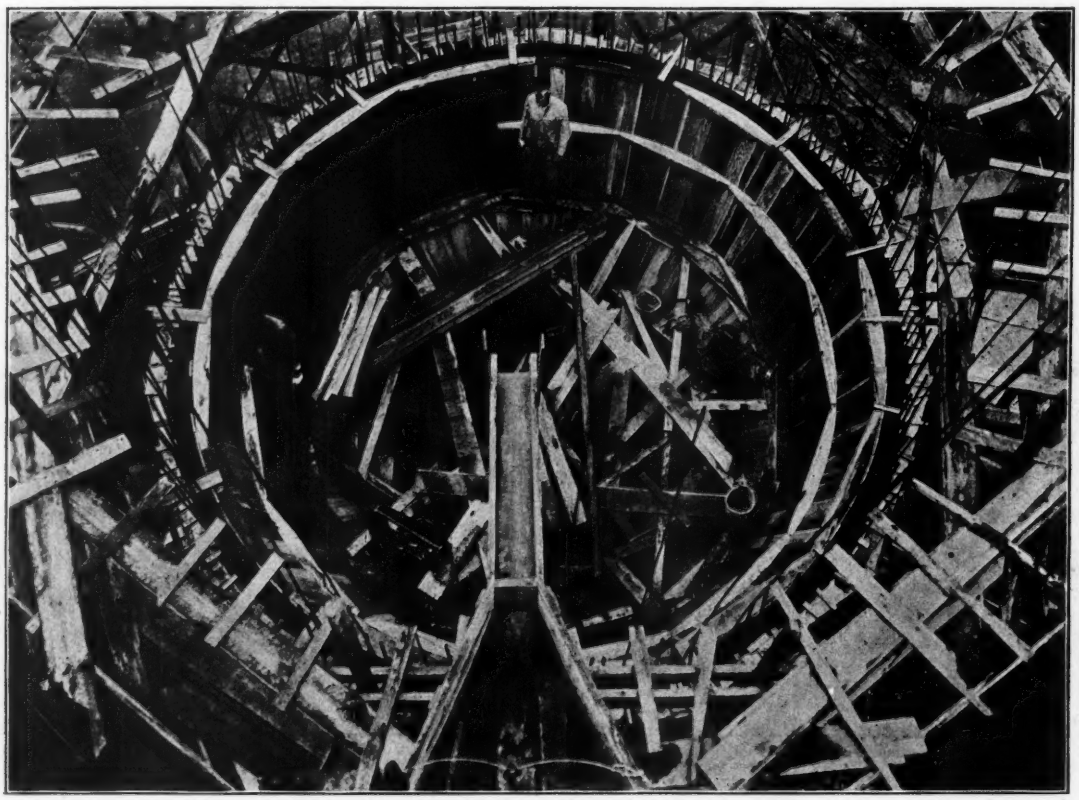
After this test the dryer speed was increased and a new

test made. The sand at this time contained 3¼ per cent of moisture.

The length of test, 13.5 hr.
Cubic feet of sand dried, 3,200.
Pounds of coal used, 4,400.
Power used, 300 kw. hr.
Weight of water evaporated per pound of coal, 2.55 lb.
Tons of sand dried per hour, 11.84.
Tons of sand dried per ton of coal, 73.

Cost of labor per cu. ft. of sand,	$0.0026
Cost of coal per cu. ft. of sand,	0.0012
Cost of power per cu. ft. of sand,	0.0009
Cost of sand and freight per cu. ft. of sand,	0.0172
Interest, depreciation and taxes (12 per cent),	0.0104
Total,	$0.0323

The total cost of drying 6,000 cu. yd. of sand by the stove method, including the cost of maintenance, etc., of the necessary dry-sand storage bin, would amount to about $7,290 per year. The total cost of drying at the new plant, figured at $0.0323 per cu. ft., is $5,232.60, a saving of $1,957.40 per year, $510 of which is due to the saving of $3 per car for switching charges.



Forms and Reinforcement in Conical Bottom of Dry Sand Storage Bin.

The Canadian Pacific has awarded the contract for constructing its $1,400,000 depot at Vancouver, B. C., to the Westinghouse, Church Kerr Co., New York City.

It is expected that the city of Omaha, Neb., and the Missouri Pacific will soon reach an agreement in regard to the construction of the proposed Dodge St. viaduct.

The New York Central is reported to have let a contract for the construction of a new bridge over the Oswego River in Oswego, N. Y., estimated to cost $240,000.

DANGER OF SHORTAGE OF RAILWAY FACILITIES AND POSSIBLE PREVENTIVES.

By Chas. L. Sullivan.

The dangers of shortage of railway facilities are most apparent to those most concerned in providing adequate facilities for the safe and economical transportation of goods and people, and they are saying, "Show us how to provide what is needed."

In the opinion of the writer of this the answer is found, not in following one course, the one course of issuing new bales of securities, but in a comprehensive course that includes the issuing of additional securities plus the discontinuance of practices that lead to losses, plus the adoption of plans of financing and operation that will increase gross and net earnings. And some suggestions are made herein of plans that are thought to be of favorable relation to the above conditions.

The texts for this essay are found in a declaration from the Interstate Commerce Commission, 1908, to-wit:

"That the inadequacy of transportation facilities is a little less than alarming," and in the statement of results of an inquiry made by the Railway Business Association and published in the bulletin of the association, also to-wit:

1. Locomotive, car and track capacity have increased since 1907 at a rate immensely less than what will be necessary to meet an increase in traffic approximately at the rate of growth shown in the immediate past. Current net car surplus is at so narrow a margin that a very small increase per cent, in the traffic offered would produce a net car shortage.

2. Equipment requirements to carry traffic conservatively estimated for the five years ending 1915, will cost the railways a sum enormously in excess of their probable resources from earnings.

3. It will require the sale of new securities to an amount many hundred millions greater per annum than in the im-

mediate past to obtain the necessary sums not available from income.

4. In order to attract purchasers and to justify incurring the obligation to pay a return on such new capital, the railways must be reasonably assured that freight rates will not be further reduced.

5. The public has now taken control of the rates. With the public the decision rests whether the rates shall or shall not be adequate to enable the railways to meet the necessities of the shippers. Failure to provide the facilities which will be needed to carry the traffic must be laid at the door of the public and the public must provide the means for providing the facilities.

That railway officials of single mind to the operating of railroads for the best interest of all concerned are trying to improve transportation facilities and at the same time reduce cost of operations, no generous minded man acquainted with the facts will deny. But the means are not at hand to do both of these things, or even to do one of them adequately; it requires means to reduce costs of operation and to increase facilities.

Railroad wreckers have been nearly all squelched. Hold-up politicians are rapidly losing their power, private car grafting is nearly at its end, rebating has had its wind knocked out, inequitable Federal and State laws have been recognized as poor means for bringing benefits to the people; equipment trust syndicates and banking syndicates still demand, and get, their pound of flesh in the form of 5 per cent to 7 per cent for marketing bonds, stocks and notes of railroads at liberal commissions and discounts.

The Big Thing, among a multitude of other things, that ails railroads today is the high rates of interest paid for borrowed money, or money secured by the sale of bonds and notes. The Federal Government can market bonds at any time and in any amounts at as low as 2½ per cent. The people through the Federal Government should undertake and complete the job of bringing about conditions that will establish equally as good credit for the railroads, although not necessarily establish as low rates of interest as 2½ or even 3 per cent.

Not even the conservation of natural resources, the regulating of business combinations, the reform of the currency and banking laws, the country's foreign policy, or the settling of the tariff question are of greater importance than the rescue of the railroads from their present demoralization, their restriction to the legitimate functions of selling transportation pure and simple, and the placing within their reach the means at low cost for much needed betterments and extensions. The country's internal development and its growth among nations are dependent more upon the railroads as means to these ends than upon any other one media in political, business or social life. Railroads might be considered as the nation's largest and most valuable resources.

Our railroads were the most important means that opened and developed the country and this credit is due them regardless of errors, private exploitations and other undesirable things inevitably accompanying the rapid building of a nation or of a big industry.

The Panama canal is of Nation and World importance and our country was the one to build and control it, but the railroads immediately within our borders are nearer to the interests of our people than is the canal.

That the people are determined that our railroads shall exist and operate for the interest of the whole people and not alone for a small minority bent on building large private fortunes, is evidenced in the increasing volume of the voice of the people expressed through irrepressible agitation for rate regulation laws, and in a not insignificant nor lessening demand for Government ownership of railroads, and in the growing utterances in favor of Socialism.

To ward off the calamity of extreme Socialism it is necessary to increase the scope of Federal Paternalism. But Government ownership of railroads is not necessary in order to secure to the people the rights belonging to them resident in their ownership of the power and right of granting privileges for operating, and making reasonable profits only out of public utilities. The people own the rights in public utilities as they own the air, and light and the land and the water, and as they should own the natural resources upon which man is depending for maintaining life. Failure to secure these rights from existing political and social order of things will drive the people to force a change and at present a change means Socialism which means in part, Government ownership of railroads.

In the Railway Business Association bulletin, referred to above, it is stated: "the public has now taken control of the rates, and in time equitable rates will be established."

Up until recently our railroads were financed and manipulated almost to the exclusion of the rights of labor and the public generally; the only thing that was recognized as having any right or interest was the dollar.

In the long fight between the dollar oligarchy on one side and the general public and labor on the other side, the railroads were bound to lose. The people look to the Federal Government to protect them as the supreme interest for which governments are organized. The people have the last word, and if government as exercised does not properly care for the people then Congress and the courts will be changed. At present the people are not very well satisfied.

The thing of greatest importance to the country at the present time, and the one needing immediate attention is TRANSPORTATION. There is danger in delay. The country is tired of its greatest natural resources being used by individuals, syndicates, pools, trust companies, insurance companies and banks to build in a few years large fortunes for a small ring of men that control the means for such use.

One of the ways for warding off either the necessity or the demand for Government ownership of railways is for the Federal Government to provide a way for supplying railways with needed funds for extensions and adequate facilities and for a management that will institute a uniform rate of operating as contrasted with the present spasmodic rate, and at the same time make railroad stocks and bonds staple and sure earners of reasonable dividends and interest. This would of necessity eliminate stock watering and materially reduce gambling in railroad securities called by courtesy by another name. It has been frequently said that the financial interests in control of our railroads can and do arbitrarily make or retard prosperity in our country, and that this power has been used, and is now being used to mould political and social conditions favorable to the retention of this power in the hands of what is either rightly or wrongly called the money trust as distinguished from the general public.

The Railway Business Association bulletin states, "equipment requirements for five years ending 1915 will cost the railroads a sum enormously in excess of their probable resources and earnings." And other statements in the bulletin show railroads in such conditions and working under such restrictions as to make it practically impossible for them to add adequate facilities, to make extensions, etc., unless material changes in the conditions and restrictions shall be made. Present methods followed by the railways in obtaining funds is to sell stocks, bonds and short time notes to banks, syndicates, trust companies, etc., at rates of interest averaging probably 5½ per cent for all railroad companies and covering the several kinds of securities sold. And these securities seldom net par to the railroads. There are exceptions when money costs railways 3 per cent, 3½ per cent, 4 per cent and there are many loans at 7 per cent in the form of equipment notes, special bonds, etc.

No mercantile industry could pay dividends or make liberal

additions to plants for increased facilities, by earnings as low as are represented in the receipts by railroads at present freight and passenger rates, rates of taxation, legal expenses, etc., should said earnings be burdened to pay 4 to 7 per cent on securities far beyond the fair cash value of said industries and excluding a value for charter or franchises. The burden in the case of railroads is as much in the high interest rates as it is in the relative amount of securities drawing interest. The conditions would not be so bad should railroads receive par or nearer par than they generally receive for the securities put out.

A saving of about 1 per cent in the average interest rate would be a sum equivalent to an increase in receipts from a fair increase in freight and passenger rates, and would probably take care of the increase in prices of materials, labor and taxes.

That I am not alone in thinking that railroad companies pay too high interest rates is proved by a quotation from the Railway Age Gazette of April 19, 1912, on page 877, in a first page editorial commenting on an address delivered by Mr. Delano before the convention of Commercial Associations of Michigan in a meeting at Detroit, April 17th; the comment being that railroads have been beset (among other things) "by increases in the rate of interest."

The public is not so much interested in securing high rates of interest as it is in securing protection to its capital, certainty of continuous income, and in stable business conditions. Loans to railroads are now made by those who loan to and those who control the roads, and being the same individuals the transaction is like loaning money to oneself and making an innocent party, the public, pay the interest.

The plan here suggested would provide a cheaper money market to which railroads could go and where they would receive a full dollar in cash for a full dollar of security paid out; it would create a source of money supply at any time when needed regardless of and in opposition to the too frequent artificial conditions prevailing in Wall Street and the humor of big money lenders. Under this plan the people would find railroad securities better things to put money into than even the Postal Banks. It is probably true that this plan would be opposed by the investors composing the present money market, whether such market is a money trust or a condition of financial operations based on custom and on the elements of demand and supply; demands for loans and supply of funds for making loans. But the public. as distinguished from professional money lenders, would supply more than the loss resulting from the withholding of loans by the "market." The people thus in time would own the roads.

A flood of funds from abroad would come over were our Federal Government back of a plan for financing our roads, and in a measure dictating major expenditures, establishing stability in rates, wages, taxes and other capital charges. And this immigration of foreign funds would strengthen our nation politically and lessen the chances of wars that would endanger the investments of the people of other nations.

A provision for confiscation of foreign investments in our railroads would be more effective than arbitration treaties.

The Federal Government should control the financing of railroads as it now controls rate making. Passenger and freight rates should be established that would allow a fair interest return on railroad securities and fair dividends, and these rates should remain in force for at least five years before being changed either up or down.

The central idea of the plan is that the Federal Government should create a fund by the direct sale of bonds, or by guaranteeing the interest on bonds to be sold by railroads under popular subscription. The fund to be provided to be one billion dollars ($1,000,000,000) the first year and five hundred million ($500,000,000) dollars each next succeeding year for four years. Either plan to be under a carefully matured congressional enactment and the fund to be available to or raised by railroads under the approval of the Interstate Commerce Commission both as to the amount and the purpose of the expenditure of same, the actual expenditures to be left to the railroads.

Those individuals, syndicates, pools, trust companies, insurance companies, and banks, that have heretofore enriched themselves by providing funds and credits at heavy expense to railroads at high interest rates and commissions, now refuse to as freely as heretofore advance funds to railroads because of the present check by public opinion to this method of rapid wealth getting and to the exclusion of the interests of the public.

Again, nondescript, indiscriminate and contradictory laws innumerable that have been passed by state legislatures composed largely of demagogue politicians, unwise honest men, and men of juvenile abilities and judgment, have, as a logical result, tied purse strings and checked confidence in the worthiness of railroad stock and bond investments; and the lack of worthiness and stability of Federal controlling laws have disturbed and deterred the investing public. Some folks with strong predilections for railroad monopolies have chosen to attempt to influence the public and legislative mind to the belief that the Panama Canal will hurt trans-continental railroads, and this unjustifiable stirring up of the public mind is another one of the deterrents to investments in fresh railroad securities.

This is not an attack upon railways, but it is an attack upon the prevailing system of financing many railways, which system, coupled with other bad conditions referred to herein, puts railway earnings under a tax so heavy in the aggregate as to amount to practical confiscation of the earnings.

Railways are probably not over-capitalized if we consider the cost of reproducing them at present prices; but they are overloaded with unnecessarily high interest charges on securities other than capital stock certificates.

If sufficient revenue cannot be secured from present tariff rates, and if Wall Street will not furnish funds except at its dictation as to volume, time of lending, interest rates, and dictate how funds shall be expended, and through what channels, and if therefor both the railroads and the public suffer then the Federal Government should provide a way whereby the roads could go direct to the public for funds, and then roads should be operated irrespective of the attitude of Wall Street.

If revenues under present rates are not sufficient to enable railroads to supply adequate facilities, to pay increased taxes, increased wages and other increased costs of operating, and as the established order of things, and the attitude of the public mind, will not permit of rate increases, then railroads must practice economies in new directions; (and a few of these directions is suggested herein) secure stability in rates, wages and taxes, and pay less for funds secured by issues of securities, and also, lower dividends must be expected and accepted until roads are enabled to increase net earnings as reward of increased facilities and reduced costs of operating.

There is an impossible condition of things facing railroads. There is an "unreasonable restraint" upon their conduct as public utilities. The removal of this restraint is within the constitutional prerogative of the people acting through the creation of its own will, i. e., the Federal Government. No self constitued oligarchy of a moneyed minority should be allowed to exploit the people's best possession, TRANSPORTATION. The people's rights are prior to the rights of the money power. It is not now so much that railroads need

control as it is that money lending to railroads and money spending by railroads need control. Conditions should be established that would cause the people to feel as secure in investing in railroad securities as they would in depositing their money in national banks that are supervised by the Federal Government, and for the same reason.

In the past and at present the financing of railroads has been and is on the plan of when, how, and how much, at the dictation, whim or by the policy for effect upon the public and legislative mind, of the monied minority controlling the distribution of the controllable funds available in our country.

If it is accepted that the present stock capitalization of our roads is not excessive, but only represents a fair cash value of the roads, if it is true that liberal dividends could be paid upon all outstanding stock, if transportation rates, taxes, wages, cost of equipment and supplies and interest rates were more stable and the present minimums and maximums not changed for a series of years, then, to enable roads to secure the considerable sums needed, and which admittedly cannot now be secured from earnings, it is not necessary nor advisable to increase capital stock issues on present railroad properties, but instead to secure loans on convertible bonds and short term notes depending upon the several conditions that would govern. As roads would be added to by increased trackage of parent roads, extensions, and the building of feeder lines, the convertible bonds and notes could be redeemed by issues of capital stock at par covering the new plants and thus balancing new stock issues with the new railroad plants.

Roads doing interstate business should be nationally chartered, state charters to be surrendered or their cancellation purchased, capital stock of interstate roads to be freed from state taxation, and in lieu of Federal direct taxation there should be an income tax by the payment of a small percentage of the dividends, and periodical reports from railroads should be made of the names of stockholders, the list to give the number of shares of stock owned by each person and the dividends paid and other information that would prevent dodging of the income tax and insure a full return in payment of said tax. In case of foreign holdings of United States railroad stocks there should be a straight tax instead of income tax.

As it is believed that the borrowing credit of all interstate trunk lines should be equally good, and it is believed that it would be, under the plan of financing here suggested, then roads should deposit their bonds at par at 3⅞ per cent with the Federal Government for the amount of funds needed and to be drawn from the funds provided by the sale of specific United States bonds at 3¾ per cent. The railway bonds for this transaction should be a lien exclusively upon the new trackage built, upon new terminals purchased, laid out and equipped, and upon new equipment or rolling stock, and the present outstanding bonds should be excluded from participation in the new values thus created. As old bonds would mature there would be no need of issuing new securities to take their places.

Eventually roads would have no securities out but stock certificates representing the real value of roads exclusive of the value of their charters; the charter values remaining an asset of the public.

Presumably present outstanding bonds would increase considerably in speculative market values, but this would not of course increase their interest rates or lay any additional burdens upon railroad earnings.

Should there be bonds maturing earlier than the time required for securing by the railroads of definite benefits from the improvements and increased earnings under the operation of this plan, then such bonds should be refunded at 3⅞ per cent (unless some of them should now be bearing less rates of interest), and the new bonds for refunding should be convertible bonds for short terms.

If some roads can sell 3½ per cent bonds why would it not be a good thing to establish a plan for financing, and safeguarding railroads so that all could sell at 3½ per cent or not to exceed 4 per cent bonds? A saving of 1 per cent in the average interest rate on the upwards of nine billions of railroad bonds now outstanding would mean a saving of 90 millions of dollars per year. This amount added to what might be saved in some such ways as are suggested below, and these added to the increases in earnings coming from adequate facilities would supply our roads with the funds that they need, but which they say they cannot now get.

All trunk line bonds should bear, and would be acceptable to the general public at the same interest rate under the plan here suggested. And it would not be necessary for roads to pool their earnings for common distribution in the form of dividends.

After 10 years, dividends on railroad stocks above 6 per cent should be devoted to still further increase the facilities of roads, or transportation rates should reduce automatically as net earnings applicable to dividends exceed a sum or sums equivalent to 6 per cent upon capital stock.

Upon maturity, or upon any interest date and notice, bonds deposited by railroads with the Federal Government for loans under this plan, are to be exchanged for stock certificates, and these to be used by the Federal Government in exchange for the bonds issued under this plan. This would be the process for making the public the stockholding owners of our roads.

It is stated that the ownership of 55 per cent of our roads is in the hands of about 23 men who represent the not many more men who collectively have provided the funds for securing this 55 per cent control, and of course this 55 per cent control coerces the remaining 45 per cent. And this control by the monied minority is not a good substitute for government ownership of our roads or for socialism. And unless the present order of things in the ownership and operation of our roads is changed to a larger public ownership of our roads and their operation for the rightful benefit of the public, then government ownership or socialism or both will come with a certainty.

To further emphasize the statement that roads are handicapped by high interest rates it is only necessary to note a few modern instances of loans secured by the issue of securities. One road has just sold 10 million dollars worth of 7 per cent bonds, the annual interest charge is 700 thousand dollars; at 4 per cent the interest charge would be 400 thousand dollars, showing a saving of 300 thousand dollars per year.

Another road has sold 19 million 500 thousand dollars of 4½ per cent gold notes at an annual charge of $877,500. If sold at 3⅞ per cent a saving of $121,875 would be made. The St. Paul road has sold or is about to sell 35 million convertible bonds at 4½ per cent, and the interest charge is one million five hundred and seventy-five thousand dollars. Could these bonds be sold direct to the public undoubtedly a rate of 3⅞ per cent would have been acceptable and there would have been a saving of $218,750. That the average interest rates paid by railroads on issues of bonds is higher than a rigid conservation of earnings calls for can be ascertained by a survey of the tables of bonds outstanding as given in the railway manuals. A fairly selected list of 70 bond issues showing bonds outstanding, annual charges and interest rates, gives an average interest rate of about 4⅝ per cent, the range being a few issues at 3 per cent, not very many more at 3½ per cent, and a fair lot at 4 per cent and others at 5 per cent, 6 per cent and 7 per cent. Some bonds bear 8 per cent and one lot carries 10 per cent. Of a total list

of 1,927 bond issues the average interest rate shows above 4 8-10 per cent.

One authority states that for every dollar paid railroads between 30 and 40 cents are devoted to capitalistic uses.

It is admitted without debate that our roads are suffering a great handicapped because of inadequate terminals, as well as because of inadequate equipment. It is also generally admitted that freight terminals for cities of the first and second and third classes should be removed from the congested parts of the cities to the suburbs, and that passenger terminals in cities of these classes should be consolidated into one or two union terminals for the benefit of both the roads and the public.

But roads say that they cannot secure funds for this work. It is suggested that a large part of the necessary funds could be secured through the sale of high priced city land now occupied as freight terminals and much larger areas in suburban land be bought for freight terminals.

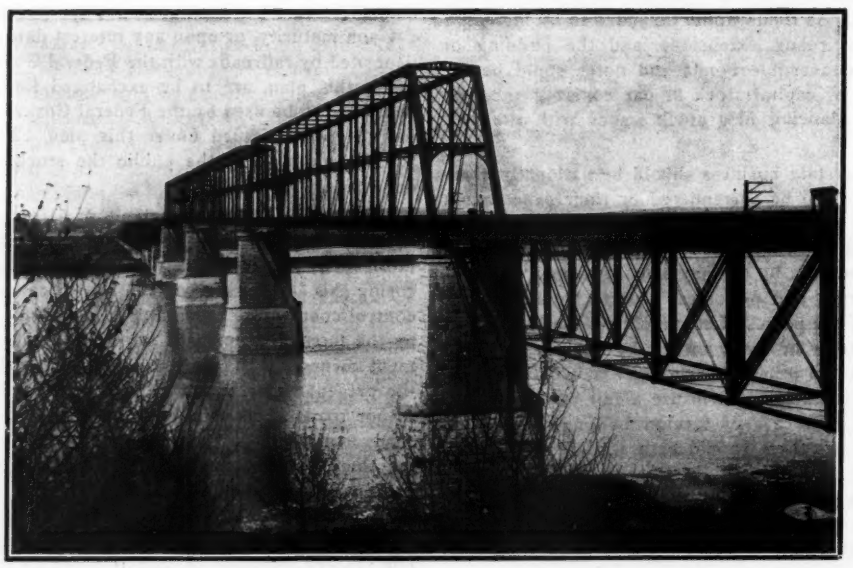
The cost for the concentration of passenger terminals should be borne in some equitable proportion between the roads and the cities thus benfited, particularly as the building of such union terminals should be incorporated in the plans for the beautifying of the cities. The following few ways of saving in expenditures could be followed:

Stop rebating; dispense with high priced lawyers and materially reduce the amount and cost of litigation by settling out of court many cases on their merits. Refer many other cases to the Interstate Commerce Commission; settle damage claims quickly and fairly; join with the Interstate Commerce Commission in establishing fair and stable rates; stop exploitation of roads by the officers in conjunction with business interests doing contracting and selling with roads; discount practically all bills payable for equipment and supplies, absorb all private car lines; do all express business direct and in conjunction with the postal department; own coal mines, but mine and transport coal from such mines exclusively for railway use, mines to be operated on the open shop principle and the Federal Government to compel arbitration of disputes with the men and in the meantime the mines to be kept running; secure rigid laws against trespassing; adopt one standard coupler for the sake of economy and safety; double track; abolish capital grade crossings at level; and in cooperation with the Interstate Commerce Commission establish staple rates of wages under long time contracts; establish effective representation for labor in the directorate and in labor management through a special labor department as distinctive as are the traffic, mechanical and operating departments; install block signals; replace wooden cars with steel cars, and introduce other economies which are recognized as capable of being introduced under proper conditions.

REBUILDING THE MISSOURI RIVER BRIDGE AT SIBLEY.

By A. F. Robinson, Bridge Eng., Santa Fe System.

Bridge No. 594, Missouri Division, was finished during the first half of 1888. From 1890 to 1899 the long pile approach at the east end of the long steel viaduct was filled and the west pile approach was replaced by an eighty-foot deck girder span, with a short fill. At the present writing the bridge is made up as follows, beginning at the west end: one 80-foot deck girder span; one 200½-foot deck truss span; three through truss spans, each being 396 feet between centers at end pins and covering the main channel of the river; one 250½-foot deck truss span; two 175-foot deck truss spans; and about 2,000 lineal feet of steel viaduct made up mostly of 60-foot spans, with 30-foot towers.



Old Missouri River Bridge at Sibley, A. T. & S. F.

The extreme length of the bridge between the faces of the parapet walls on abutments is 4,076½ feet.

The west abutment is founded in hard clay and never has settled. Pier No. 1, next to the west abutment, also rests in a hard clay bed mixed with boulders. Pier No. 2, on the west bank of the river at low water, is founded in a heavy bed of boulders extending to bed rock. Piers Nos. 3, 4, 5, 6 and 7 are pneumatic and extend to bed rock, except pier No. 6, which rests in a bed of cemented boulders extending to bed rock. Pier No. 8 is founded on eighty-four forty-foot piles, which are driven well into the bed of cemented boulders that extend to bed rock. The deepest pneumatic pier is No. 7, which extends 40½ feet below low water level. The small piers under the viaduct towers are built on sand or earth foundations. They extend about seven feet below the ground surface.

Extreme low water is at elevation 550 feet above Santa Fe datum. Extreme high water is at elevation 587.40. The elevation of the base of the rail across the main river is 642.50.

The distance from low water to high water is 37.40 feet, and to the base of the rail, 92.50 feet.

Pier No. 3 extends thirty feet below low water and is 114 feet in total height. The caisson is 63 feet 9 inches long by 27 feet 5 inches wide, giving 1,748 square feet of bearing surface on bed rock. The weight of pier No. 3 is 6,775 tons. Under the maximum loading used the new superstructure will add some 3,160 tons, making the total 9,935 tons on the foundation under pier No. 3, or almost five and three-quarters tons per square foot.

The live load used in designing the old superstructure was two 86-ton engines, coupled and followed by a train weighing 3,000 pounds per foot of track. These consolidation engines had 24,500 pounds on each driver axle.

The 396-foot through spans are 50 feet deep between centers of parallel chords and are what is known as double intersection trusses; i. e., each diagonal web member crosses two panels.

On account of the increase in loads during the last ten years, and the still further increase now in prospect, the entire superstructure is being replaced. For the new structure E-60 loading is used. This is two consolidation engines weighing 213 tons each and followed by a train weighing three tons per foot of track. The drivers are spaced five feet on centers and their axle loads are thirty tons each.

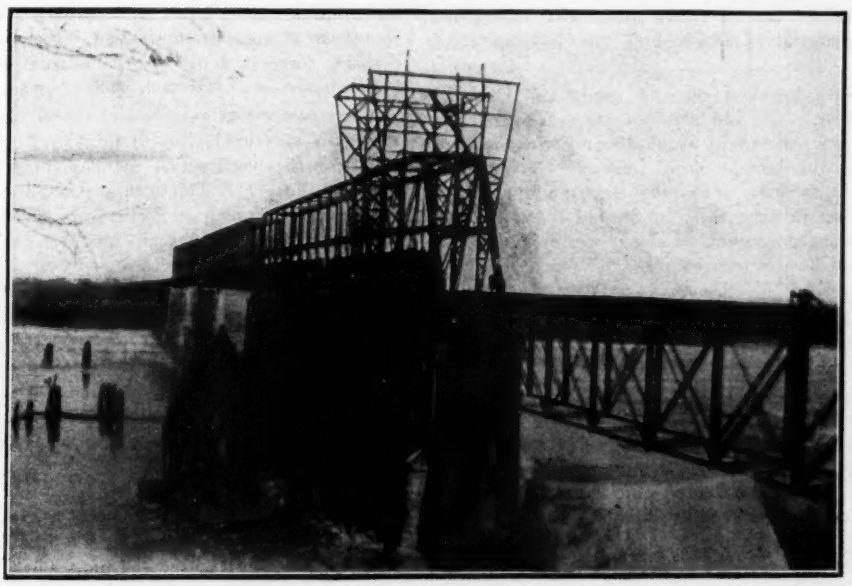
In the west approach the 200½-foot deck span will be replaced by a center pier and two 100-foot deck girder spans, the 80-foot girder being replaced by a new span of the same length. The deck truss spans in the east approach will be replaced by new spans of the same lengths, the tops of the piers being built up so that the spans will rest directly on the masonry rather than on steel bents as at present.

In the east approach viaduct both sub and super structure are to be rebuilt. Span lengths have been so taken that the new piers will dodge the old ones. Most of the spans are to be 90 feet, with 45-foot towers. The concrete piers will project from six to seven feet below the ground surface and will be founded upon reinforced concrete piles thirty feet in length.

The three 396-foot spans over the main channel of the river are being replaced by spans of the same length. They are what is known as the Petit truss (or truss with subdivided panels). From the west abutment to the pier under the two 175-foot deck spans in the east approach the grade is level; from this point to the east end of the east approach viaduct the grade is .8 per cent downward, eastbound.

In rebuilding, the track at the east end of the viaduct will be raised 6.87 feet and the grade across the viaduct reduced to .5 per cent. The elevation of the base of the rail on the main structure will not be changed, but the lower clearance line in the 396-foot spans will be two feet below the corresponding line in the old bridge.

One of the interesting problems in the rebuilding operations is the grade reduction over the east approach viaduct from .8 per cent to .5 per cent. This will be accomplished by jacking up the old viaduct in a series of lifts of about twelve inches each and blocking on the old piers. Beginning at the east end of the viaduct the process is about as follows: The first step is to jack up the ends of the girders on the abutment twelve inches and carry this elevation out until it meets the present grade, blocking on the old piers. The next step is to jack up at the ends another twelve inches and carry this out until it meets the old grade. The fill in the high bank east of the viaduct will be carried up as the lifting of the metal work progresses. All this grade revision has to be carried on under traffic.



West Span, Showing Falsework and Traveler.

Cottonwood, Kan., stone and natural cement were used in building the piers above the ice line. In piers Nos. 2 to 5, under the 396-foot spans, the stone has weathered badly and several large pieces have commenced to crush. On account of the poor condition of the masonry eight to twenty feet is to be taken from the tops of piers Nos. 2 to 5 and the piers rebuilt in concrete. In doing this work two concrete buttresses are built on each side of each pier. These are founded on the top of the pneumatic crib and on top of the three steps of the footing. Steel rods are run through the piers and have large washers at their outer ends which are imbedded in the concrete of these buttresses. The tops of the pneumatic cribs are about five feet below low water, and the concrete work is carried high enough so that the same steel bents may be used on all four of the piers. These steel bents are placed one on each side of the piers, resting upon heavy cast iron bases, placed on top of the buttresses. About fifteen inches of clear space is left between the sides of the pier and the metal work in the steel bents. Each column in these bents is made up of four 20-inch 80-pound

I-beams 76 feet in length. On top of the steel bents heavy cross girders are placed, and the old spans will rest upon these, thus taking the entire load, including the traffic, off the top of the pier and placing it on this steel falsework. The steel bents are bolted together by 1½-inch rods extending clear through the pier. These rods are in rows about ten feet apart, vertically.

Some two hundred and fifty tons has to be lifted at each end of the pier when taking the spans off the masonry and placing them on this steel falsework.

A ballast deck is to be laid across the entire length of the new structure. There will be a footwalk and hand railing on one side. All telegraph and telephone wires will be carried across the bridge on brackets, which are riveted to the trusses on the downstream side. These brackets will be so arranged that line repairers can get onto them directly from the deck of the bridge.

Perhaps few will realize how much the falsework costs for rebuilding the bridge. Under the three main spans the estimate is $60 per lineal foot, with $20 per lineal foot for the falsework under the other truss spans. More than one million feet board measure of sawed timber is required in the bents and bracing for the falsework under two spans, and fully as much material is required in the wooden track stringers.

Some comparison between the old spans and the new may be of interest. The old 396-foot spans weighed 617 tons each. The new spans will weigh about 1,540 tons each. In the old spans the largest chord pin was six inches in diameter, while in the new spans the corresponding pin is to be twelve inches in diameter. In the old spans the bottom chord bars are seven inches deep, while in the new structure they will be fourteen inches.

In designing the new structure every effort has been made to provide for all probable conditions and to make a bridge which will meet the requirements of a heavy, fast traffic for many years to come.

While the new bridge will be a single track structure (as the piers under the main spans would not permit of double tracking), gauntlet tracks are to be laid across the entire structure and will be carried about six hundred feet east of the east end of the bridge onto what is known as the Floyd tangent. The regular double track will meet these gauntlet tracks at both ends, and the safety of traffic will be insured by proper interlocking.

The three main spans and the piers supporting them will be provided with lights to mark the channel and to show navigation interests the location of the piers at night. All these lights will be electric and will be handled from the operator's tower at Sibley station.

From the east end of the bridge to Fishing River, a distance of about three miles, more than a million cubic yards of earthwork will be required in building the double track embankment and in reducing the grade from .8 per cent to .5 per cent. All the filling will be hauled from the steam shovel cut in the bluffs west of Sibley. This material has to be hauled across the bridge, in addition to the regular traffic.—Santa Fe Employes' Magazine.

The Lehigh Valley is planning to put up a brick passenger station at Meeker avenue, Newark, N. J.

The Minneapolis, St. Paul & Sault Ste. Marie has filed plans with the city engineer for the construction of a viaduct over the tracks on Mississippi street at Cayuga street. Work will be commenced on the structure, which will cost $20,000, as soon the plans are approved.

The New York Central & Hudson River will make improvements at Utica, N. Y., which will include the extending of the freight yards and putting up a new passenger station. Work is already under way on the substructure for the passenger station. The cost of the improvements will be about $1,500,000.

The New York Central & Hudson River has begun plans to rebuild the car shops at West Albany on a larger and more modern scale. Work upon a new paint shop is already under way and that upon other buildings will be begun soon. The company will expend over $1,000,000 upon this work.

The Norfolk & Western has awarded a contract to D. W. McGrath, Columbus, O., amounting to about $100,000, for shop buildings to be erected at Joyce and 5th avenues, Columbus. The work includes a roundhouse costing about $40,000; a machine shop, a store and oil building.

It is stated that work will be started shortly on the proposed viaduct of the Southern over its yards at English street, Bristol, Tenn.

In connection with the construction of the new Western Maryland branch from Charlton Station 12 miles west of Hagerstown into Berkeley County, W. Va., it will be necessary to construct a bridge over the Potomac River two miles above Williamsport, Pa., estimated to cost $240,000. H. R.

The Chicago, Milwaukee & St. Paul has begun the construction of an outbound yard between Manheim and Bensonville, Ill., about 15 miles from Chicago. The work will be done by company forces and will also include the building of a 30-stall engine house, 90-ft. turntable and a mechanical coaling station.

It is reported that engineers of the Chicago, Milwaukee & St. Paul have submitted plans to the City Engineer of La Crosse, Wis., for the construction of the proposed viaduct over the tracks at Rose St. This company is also planning to build a new passenger station at Perry, Iowa, and is seeking a site for a new roundhouse and machine shop.

The Chicago, Milwaukee & Puget Sound will begin work this summer on a new passenger terminal at Tacoma, Wash., at an expenditure of $1,000,000.

It is stated that the Delaware & Hudson will expend $100,000 for the construction of a new roundhouse, water tank, coaling station, cinder pits and other improvements on the company's East End property, Binghamton, N. Y.

Work will not be started until the fall, it is said, by the Grand Trunk on the construction of the proposed new roundhouse at Kalamazoo, Mich.

The Great Northern has let contracts to Guthrie & McDougall for work amounting to about $35,000, including additions to station facilities and trackage and the removal of five steel bridges at Spokane, Wash.

The Hill lines contemplate terminal improvements, to cost about $3,000,000, on the property recently secured on the east side of Portland, Ore.

George A. Fuller Co., Chicago, Ill., has been awarded the contract by the Michigan Central for the construction of the new passenger depot at Detroit, Mich. The total cost of the station will amount to approximately $2,250,000.

The Kentucky & Indiana Terminal is spending about $2,025,000 on a new heavy double-track bridge over the Ohio river, between Louisville, Ky., and New Albany, Ind.

The New Orleans, Mobile & Chicago has let a contract for the construction of a new freight and passenger station at Laurel, Miss., to W. M. Carter of Laurel.

The Northern Pacific has completed plans for the construction of a bascule bridge over the government canal at 12th Ave., N. W., Seattle, and for the reconstruction of the existing tracks between Ballard and Fremont.

The Pennsylvania is to enlarge its yards at Sandusky, O., to accommodate 4,000 cars, and other improvements will be made at a total expense of $40,000. This company has also authorized an expenditure of approximately $200,000 for the construction of a roundhouse and the alteration of yard facilities at Indianapolis, Ind.

OGDEN AVENUE VIADUCT, B. & O. R. R.

The Baltimore & Ohio has recently completed a 6-span viaduct over Ogden avenue boulevard, Chicago, in which some new architectural effects were obtained. The viaduct carries four tracks, and is located just north of an old viaduct, or rather several adjacent viaducts.

The boulevard is unusually wide, and is divided into four sections under the viaduct: the west section contains the south-bound street car track, which is built as close as clearance allows to the first row of columns in the street. Between the street car track and the sidewalk is a wide roadway. The east section is similar to the west. The two central sections are wide and are mainly for the use of automobiles.

Just south of the B. & O. structure is a 6-track viaduct of the Chicago & Northwestern. The next section, the south one, carries 6 tracks of the Pennsylvania Lines West. Between the viaducts of the different railways large openings were left, and the light under the viaduct is much better than if it was built in a continuous structure.

The new viaduct is structural steel. The floor is trough construction covered with concrete and waterproofed with Sarco. The floor is supported on columns made up of two wide plates with angles riveted to the edges. A third plate is fastened between the other two at the centers by means of four angles. The spans next to the abutment are short ones, the columns resting on the outer edge of the sidewalk. I-beams were used for the floor of this span. Concrete was filled in solid to the bottom flanges, these being the only part of the I-beams visible. Above the waterproofing is a layer of concrete, directly on which the stone ballast was placed.

The viaduct is located on a curve, and the facia girders are on 5 chords, two of the sections being approximately on a straight line. The girders on the south are located on 4 chords, the top of the concrete encasing them being about even with the top of the rail. The concrete on the north side, being the north exposed side of the structure, is brought well up above the track in an ornamental girder.

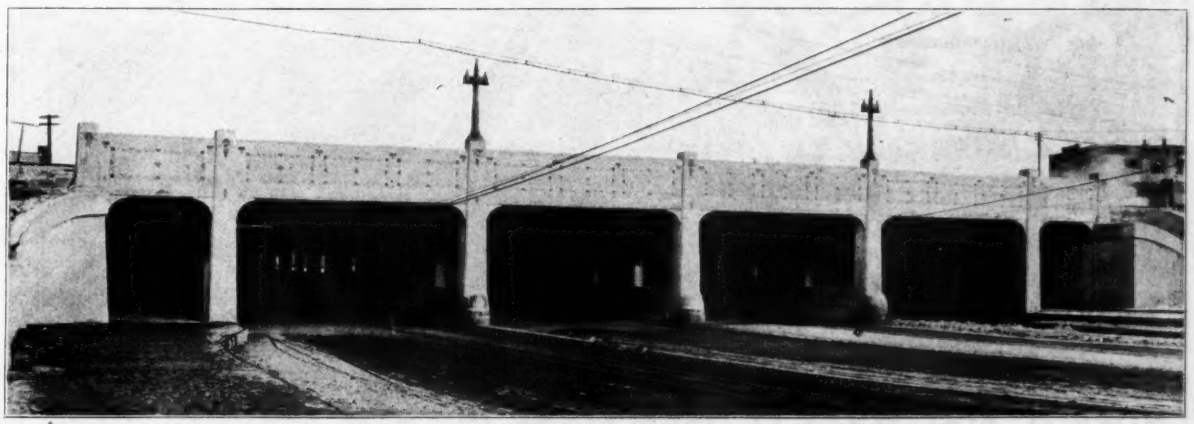
The concrete used was composed of 1 part portland cement and 4 parts crushed limestone running from dust to ¼ inch in size. The concrete was machine mixed and hoisted from the street to wheel platforms above the bridge floor. The mixer engine furnished power for the hoist, the cable being wound on the drum used to raise the charging elevator. This arrangement was made necessary by the limited room available in the street.

Owing to the comparatively cold weather during construction an expansion joint was left between the wall and the columns of a width calculated to allow for an increase in temperature of 60 degs. Both the column and wall reinforcement consists of ¾-inch round bars running in both directions. In addition to the bars a heavy wire fabric of rectangular mesh was wired to the bar reinforcement to minimize the effect of the stresses due to vibration.

The north columns were encased in concrete, giving the appearance of a solid concrete structure from that direction. The inner columns are not encased. The face of columns is approximately parallel to the general line of the bridge. The faces toward the sidewalk were made nearly parallel with the edge, the result being some peculiar quadrilateral shapes. The curves at the top of piers and the rounded abutments at the bottom add to the appearance of the structure.

The electric light posts are concrete and are finished with granite screenings, placed on the outside before the concrete, or plaster finish, had set. Electricity is supplied through wires in iron pipe conduit, encased in the concrete girder when it was poured. Small square openings give access to this conduit at each column.

The facia girders facing adjacent structures are paneled, and are carried up to a level with the top of the rail. They have a 12-inch concrete coping.



Ogden Avenue Viaduct, B. & O. R. R.

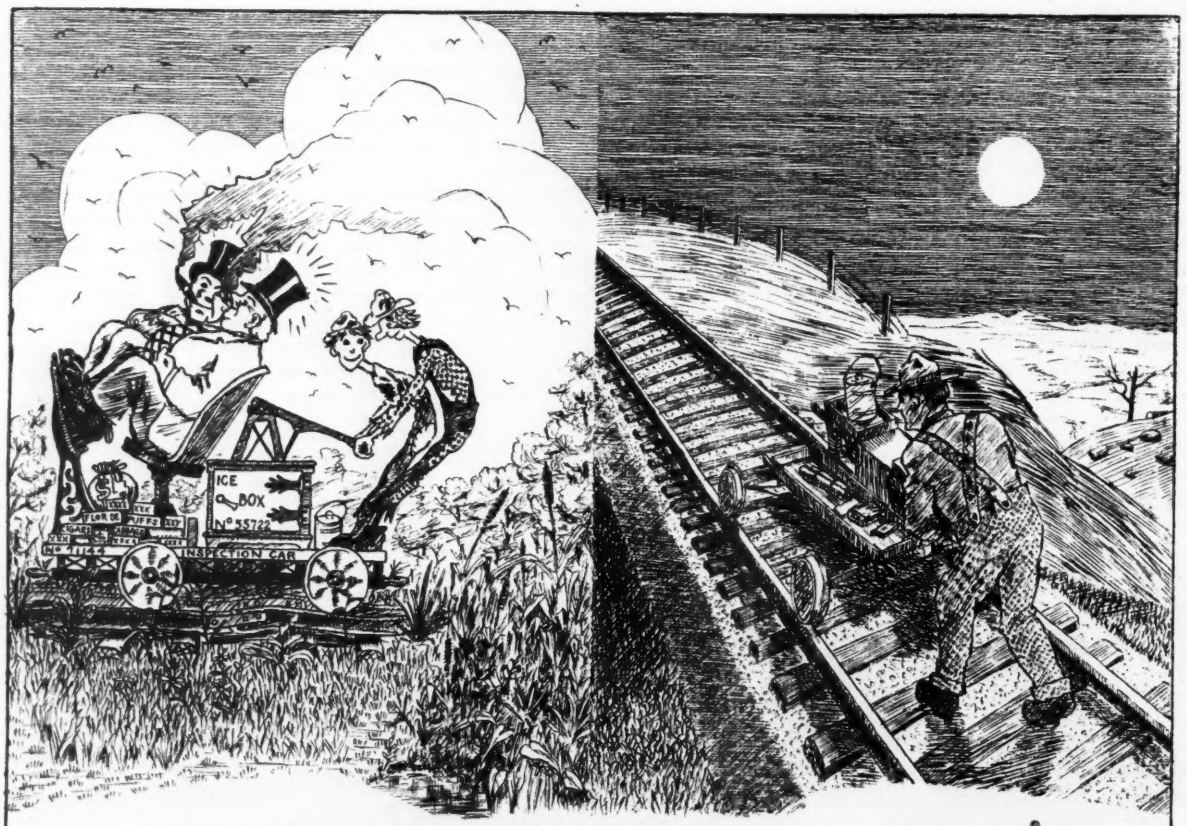
The columns for the viaduct rest on and are partly buried in a continuous concrete pier which rises about 3 ft. 6 ins. above the roadway. In the old viaduct to the south the piers originally rested on masonry piers, the tops of which were about 3 ft. 6 ins. square, and about 6 ins. above the roadway. A continuous concrete pier was added later, running straight through under the viaduct and enclosing the masonry and columns to about 4 ft. above the road.

The abutment wings are built in a curve with an ornamental lamp post just at the end. The facia girder is not panelled, but, as shown in the illustration, it is decorated by a design in colored tile. Moravian tile in three colors was used—red, blue and yellow. These tile were inserted after the concrete had set up. When the forms for the girder were built, small blocks were nailed on the insides wherever the tile was to be placed. The blocks were made the same shapes as the tile inserts, and about an eighth inch larger. After the forms were removed the tile blocks were inserted, using a cement grout.

The architectural features were designed by Price & McLanahan, of Philadelphia, under the supervision of F. L. Stuart, chief engineer. J. J. Croake, Chicago, had the contract. Universal portland cement was used, the floors being waterproofed with Sarco.

— NIGHT EDITION —

The Engineer's Distress.



NOPE IT AINT WHAT IT USED TO BE IN THEM GOOD OL' DAYS

"The Rodman's Fate"

A Rodman sat on the railroad track.
Picking his teeth with a carpet tack.
His pants had holes, his shoes needed soles
And his stomach was calling for Coffee & Rolls

He sighed as he gazed on his gun and axe.
The rod and the chain, and the miles of tracks
The ties and ballast, for his feet were callaused
And his stomach for lunch on a sandwich solaced

That night he has risen at 2:45
And into his clothes had made a wild dive
Then on the dead run, he had grabbed up the gun"
And beat it like h—l to catch No. 21.

He slept on the seat or was it the chain
And the axe in his side gave his backbone a pain
With the "gun" on his chest, and the rod in his vest
He slept on the seat for he needed a rest

At daybreak they landed at drear Lonlyville
He barely had time for to roll him a "pill"
Then brought up the rear, while the Engineer
And the big men led with laughter & cheer.

He waded a creek with the mud to his hips.
The slime trickled thru' the holes of the rips.
He climed mountains tall-oh! 'twas nothing at all
For a rodman is grit & six kinds of gall.

He worked like a sinner-or maybe-a saint-
Till someone yelled "Dinner" then he fell in a faint
The shock was to great for the most that he ate
Was a dish of spaghetti at five cents per plate

They worked for two hours "to bring the man to"
'Twas wasting some time and that wouldn't do
They finally woke him, though 'twas only to choke him
For, for one hour the Company'd soak him

He worked all day, till the daylight was done,
But they left him behind to carry the gun,
The chain & the axe. & one or two sacks
That they left behind when they ran up the tracks

He hiked down the line, as the moon rose high
He had gone but ten miles, when #4 flew by
And he knew that the rest with laughter & jest
In the "diner" were seated & eating the best

The Lonlyville station at last hove in sight
He well knew that #4 was the last train that night
The night was chill and all was still
And no one looked out tho' he yelled with a will.

And the rodman sat on the railroad track
He couldn't stand for the pain in his back.
With the black night's scowl & the hoot of the owl
Came the bull frog's croak & the coyote's howl!

L.E.L.

SAID THE INSTRUMENTMAN CONCERNING THE RODMANS FATE.

"Ive heard his wail," said the instrument,
"The tale and the woes that he underwent,
And how he gets the hooks thrown in,
But he dont get half whats coming to him!"

" When Kipling wrote " A FOOL THERE WAS,"
He had in mind that blok, because
Of things that give me one big ache
That dogone Rodman takes the cake

In making a turn he's fool enough
To hold his rod on some springy stuff;
That gets my goat- but it made me reel
When he set a bench on a freight car wheel!

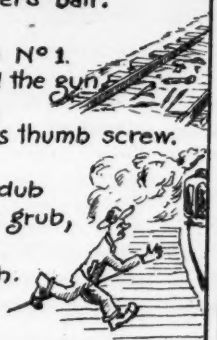
One day I said, "Some grades we'll run
I'll get our grips, you bring the gun,"
Ten miles out - it'd make a man quit,-
The simp had brought the flag and transit!

And then he said – oh he's got some nerve–
"We cant run levels, let's run that curve,
Well it was the only thing to do,
It needed lining that was true.

The vernier set, "what station is that"?
He never turned, he was waving his hat,
And the wind brought back the joyful shout
I'll see you to night and take you out.

I ran to see what her figure was,
The station I mean - not the girls- because
He never would hear (she was some doll),
He took her that night to the Farmers Ball.

Ye gods! Round the curve came N° 1.
A hundred yards back, there stood the gun
I lost the race by a yard or two,
Found some splinters of wood and a brass thumb screw.



He missed the train one day - the dub
I grabbed the stuff and a basket of grub,
And beat it alone the job to do,
Say! I was mad before I got through.

I lugged that stuff about a mile,
The box rubbed my leg like a saw tooth file,
I landed at last and almost dead
And then- the tripod wouldnt fit the head.

Oh it's funny, sure, it makes me laugh,
He makes the bulls, I get the gaff.
Trouble? Man! - its my middle name,
And the Rodman is always the man to blame.

Oh his are the days of reckless glee,
His work is done and then he's free.
To laugh, to sing or make a date,
Ah! would that mine were the Rodmans Fate.

L.E.L.

OMNIBUS EVICTUM

(Meaning "He made the mistake of thinkin' ")

J.J.S.'11

PASSENGER STATION, FORT DODGE, IOWA.
I. C. R. R.

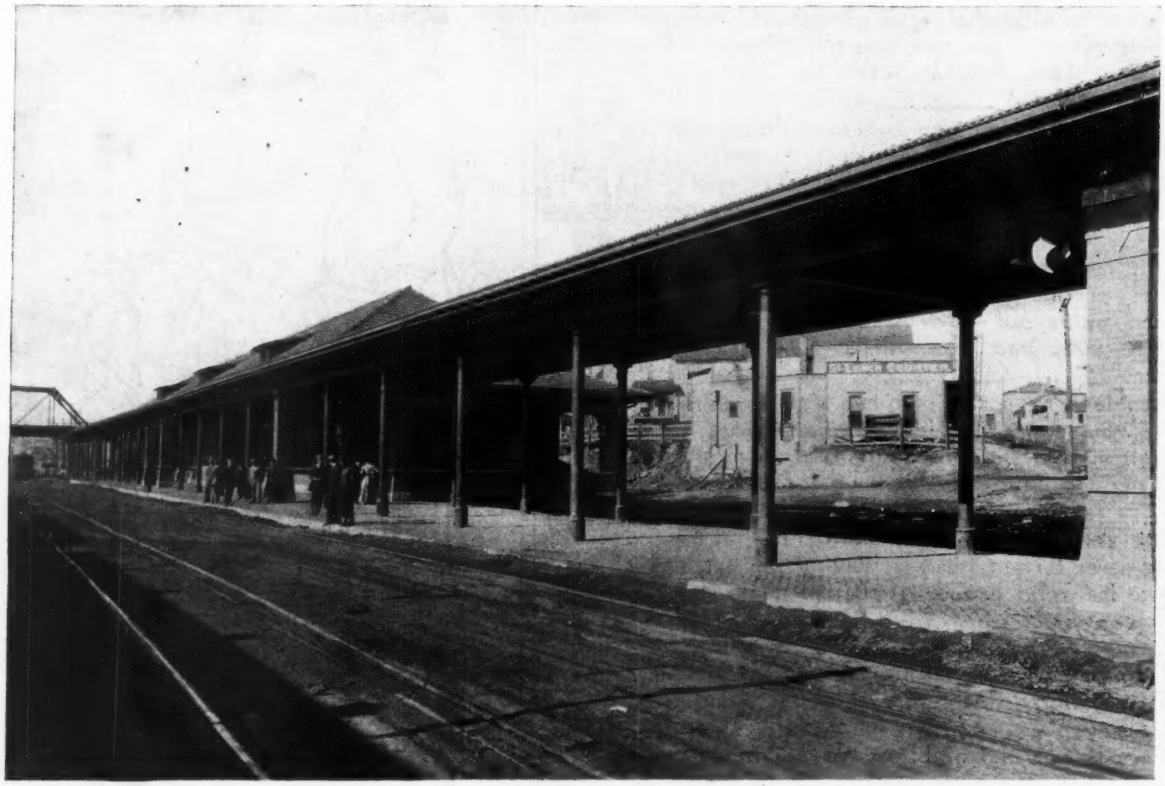
In the planning and designing of the Fort Dodge depot, it was endeavored to embody simplicity, compactness and utility, and at the same time, bring together, under one roof, all that is necessary for the convenience and protection of the traveling public.

The building is designed with a canopy 28 ft. wide, supported on brick piers and intermediate cast iron columns. It would perhaps have given a better architectural effect had brick piers been used along the entire facade. However, it was decided to use cast iron columns as they do not obstruct as much platform space and are more convenient for trucking purposes.

The canopy extends the entire length, around the two ends of the building to the rear, and 128 feet beyond the end building line, thus forming absolute protection to and from trains.

The roof is covered with red Spanish tile and is designed with a continuous pitch overhanging the canopy, terminating into a graceful curve at the eaves; this relieves the stiffness of the design and forms the profile of the extended wings, which are a continuation of the main roof, giving a long, low and pleasing effect to the entire facade, terminating with gable ends, half timber and stucco design.

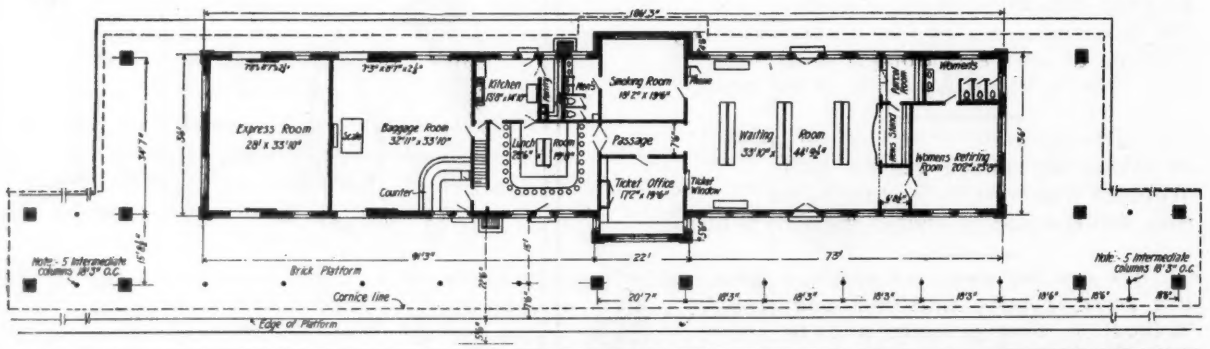
In order to break the massive appearance of the roof, three neat dormer and two eyebrow windows have been introduced as shown on the accompanying illustrations.



Fort Dodge Station, I. C. R. R.

The exterior is of pressed brick with neat brick pattern around all windows and door openings, with battered base, the sill courses being of Bedford stone. The pilasters and piers are capped with stone, and are ornamented with a neat brick design.

On one side of the central feature, which is the ticket office, is the general waiting room, with women's retiring room and toilets, men's smoking room and toilets, parcel room and news stand in connection. The above rooms have



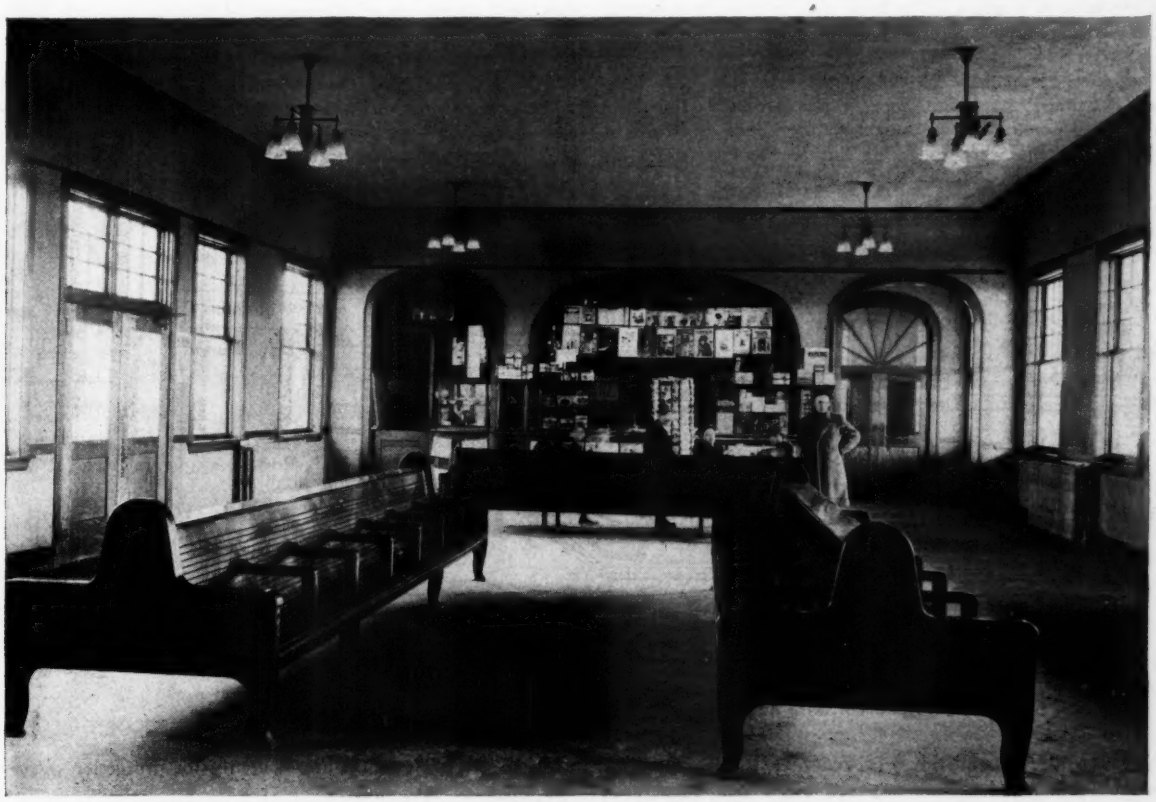
Floor Plan, Fort Dodge Station.

terrazzo tile floors and walls terminating into a cove at the ceiling with neat plaster band extending around entire room. The trim throughout is of red oak.

On the other side of the ticket office is the lunch room and kitchen, which can be entered either from the waiting room or the platform; beyond the lunch room are baggage and express facilities.

The building is heated with hot water, the heating apparatus being located in the basement. All plumbing fixtures are equipped with hot and cold water supply.

We are indebted for the data and illustrations presented herewith to A. S. Baldwin, chief engineer of the Illinois Central.



Interior View, Fort Dodge Station, I. C. R. R.

Personals

W. C. Costigan has been appointed roadmaster of the Mississippi division, Illinois Central R. R., with office at Water Valley, Miss.

C. A. Redinger, assistant engineer of the Southern has been transferred to Washington, D. C., as assistant engineer in the office of the chief engineer.

Charles Hamilton has been appointed consulting engineer of the Nevada, California, Oregon and the Sierra & Mohawk, with office at Reno, Nev.

C. E. Denny, signal engineer of the Lake Shore and Michigan Central, has been also appointed signal engineer of the Lake Erie & Western, the Northern Ohio, and the Fort Wayne, Cincinnati & Louisville, with headquarters at Cleveland, O.

H. W. Coddington has been appointed engineer of tests of the Norfolk & Western with office at Roanoke, Va.

Joseph Collins has been appointed roadmaster of the Oregon Short Line, Idaho division, with office at Shoshone, Idaho.

The office of H. B. Welsh, supervisor of the Pennsylvania, has been moved from Brocton to Dunkirk, N. Y.

Louis H. Evans, formerly terminal engineer of the committee on investigation of smoke for the Chicago Association of Commerce, has been appointed chief engineer of the New Orleans Terminal Co., and will have charge of the reconstruction of the Chalmette shops.

Clement E. Crawley, resident engineer of the Northern Ry. in Costa Rica, has resigned and the position has been abolished. His duties have been taken over by the general superintendent.

Howard B. Barnard, engineer maintenance of way of the New York & Long Branch, died on May 10, at Asbury Park.

Thomas McPherson, trackmaster of the Intercolonial at New Castle, N. B., has been appointed general roadmaster of this railway and also the Prince Edward Island, office at Moncton, N. B. A. P. Giles, trackmaster at Picton, N. S., succeeds Mr. McPherson as trackmaster at Newcastle, N. B. J. C. Filmore succeeds A. P. Giles.

E. A. Probst has been appointed division engineer in charge of construction of the line of the Southern New England Railroad, from Palmer, Mass., to Blackstone, with office at Southbridge, Mass., and T. I. Ellis has been appointed division engineer of the Southern New England Railway, in charge of construction of the line from Providence, R. I., to Woonsocket, with office at Providence. Both railways are subsidiaries of the Grand Trunk.

CONCRETE PRACTICE, N. Y. C. & H. R. R. R.*

The New York Central & Hudson River is using concrete very extensively in structures of nearly every type. A great many designs have practically been reduced to standard.

Combination Straight and Wing Abutment.

A plain concrete, combination straight and wing abutment is shown in Fig. 1. The concrete is of four grades. Class "A" concrete is a 1:2:4 mixture, the coarse aggregate being crushed stone, and is used in the 12-inch coping and the back wall. Class "B" is a 1:3:6 mixture and is used in the body of the abutment above the footing. Class "C" concrete, 1:1:2, is used only in the bridge seat. The footing is class "D", a 1:4:7½ mixture. The batter of the abutment face is 1 to 12, and the back is stepped. The back wall is of plain concrete and is very irregular on account of the abutments being on a skew.

The ratio of the base to the height is 45 per cent. The forces assumed in design were earth pressure, 115 lbs.; tive load, Coopers, E-60; impact 30 per cent of the live load. The steps were made in the footings in order to keep below the ground line. In accordance with the New York Central standards all exposed edges and corners of concrete are rounded to a one-inch radius. The backs of the abutments are treated with a coating of straight run coal tar pitch ⅛ inch thick, and the backfill is sand or other porous material. Piles were used where the soil did not give a suitable bearing.

Plain Concrete Wing Abutment.

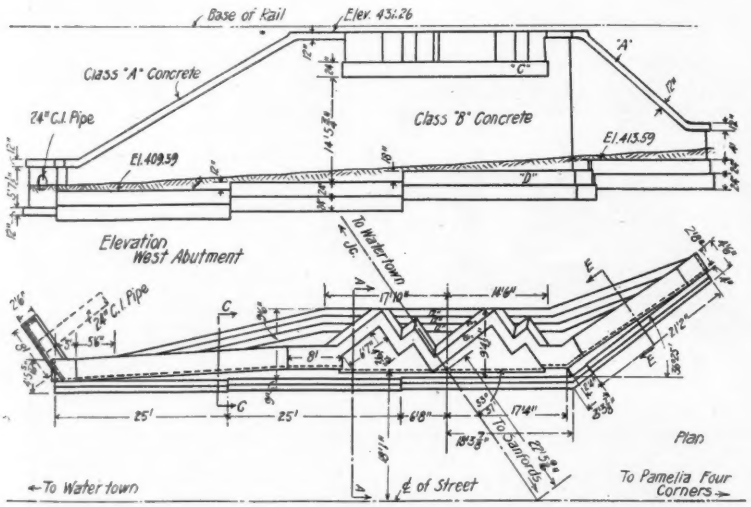
In the wing abutment the same grades of concrete are used in the different parts, as in the abutment described above. The back wall is stepped and batter of the face is 1 to 12. Ratio of the base to the height is 44 per cent. There are no expansion joints between the wings and the body. The loading assumed in the design was: earth pressure, 115 lbs. per cu. ft., angle of repose, 33 per cent; live load Coopers, E-60; impact, 30 per cent.

The footing is stepped down in order to keep below the ground surface. A pleasing architectural effect was gained by the curves in the coping and back wall shown in the elevation, this adding very little to the cost. The back wall is plain class "A" concrete, and is of the same general shape as the abutment. The corners are rounded in accordance with the standard. The backfill is a porous material. The back of the abutments are waterproofed with an eight-inch coat of straight run coal tar pitch.

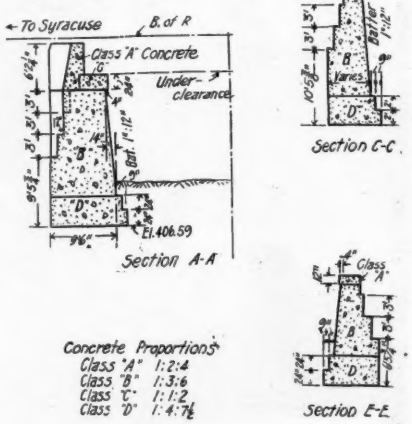
Plain Concrete Half "U" or "L" Abutment.

This abutment is really a half U or what might be termed an L abut.

Four mixtures were used in this abutment shown. Class "A," 1 to 4½ with pit run gravel was used in the coping. Class "B," 1 to 6 with pit run gravel was used in the body or main portion. Class "C," 1:3½ gravel was used in the bridge seat, and class "D," 1 to 8 was used in footings. The face of abutment has the usual batter 1 to 12, and the back is stepped. Ration of the base to the height is 41 per cent. There are no expansion joints in the structure. The same loading was assumed for designing used in the abutments described above. A reinforcement of Clinton 3x8-inch mesh, No. 8, was used in the coping, the wire net being located 8 or 10 inches below the top. The footings are stepped off following the ground contour. This "U" abutment is not a real representative of that class. As shown on the location map, the long legs of the "U" are perpendicular instead of parallel to the track, and these legs form the sides of a culvert. The wings are evidently for protection against the wash of lake waters.



Straight Abutment, with Angle at One End.



Cross Sections.

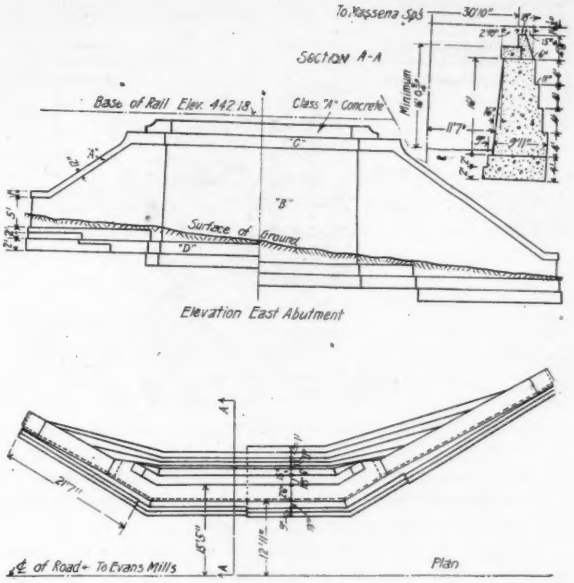
Reinforced Straight Abutment.

The reinforced abutment shown is for a highway bridge over the track. Two mixtures were used; class "D" for the footings, 1:4:7½, with crushed stone; and class "A", 1:2:4, with crushed stone for the rest of the abutment. The face has a batter of 1-inch in 2 ft.; the batter of the back is 1 to 4.

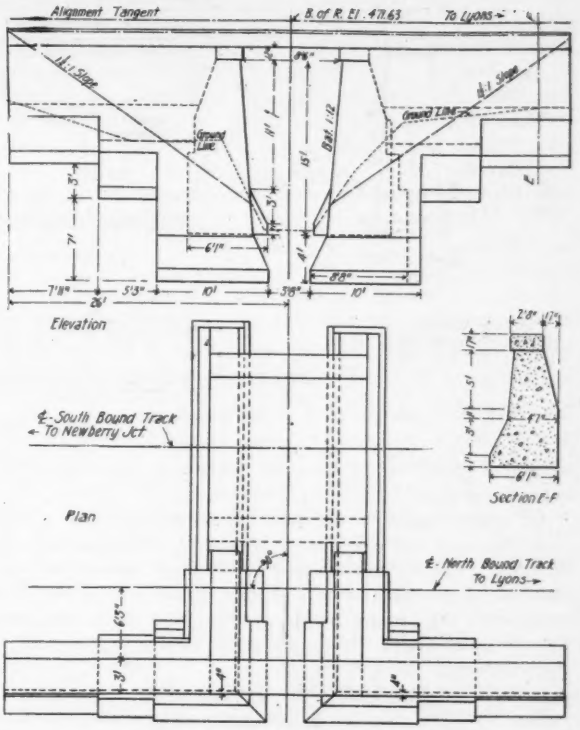
The footings have bar reinforcement in the bottom and top, and wire netting also in the top. All bar reinforcement is plain, round merchant steel. Bars are placed as shown in diagram, using a splice 18 inches long, wired. The earth pressure was assumed at 100 lbs. per cu. ft. for design; live load assumed was a street car or heavy road roller; impact, percentage, 40. The buttresses are heavily reinforced, and tied to the face by hook dowels which hook over the bars in the face slab. The face was designed as a slab continuous over the buttresses. The bridge seat and back wall were built in one operation and reinforced as a beam, supported on the top of the buttresses. Wire fabric was used to reinforce the top of the bridge seat.

The stresses for which the structure was designed were concrete 625 lbs. per sq. in.; steel, 16,000 lbs. per sq. in.; ad-

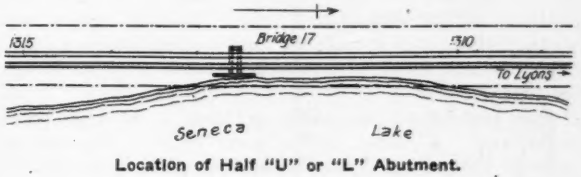
*A. M. Wolf, Contributing Editor.



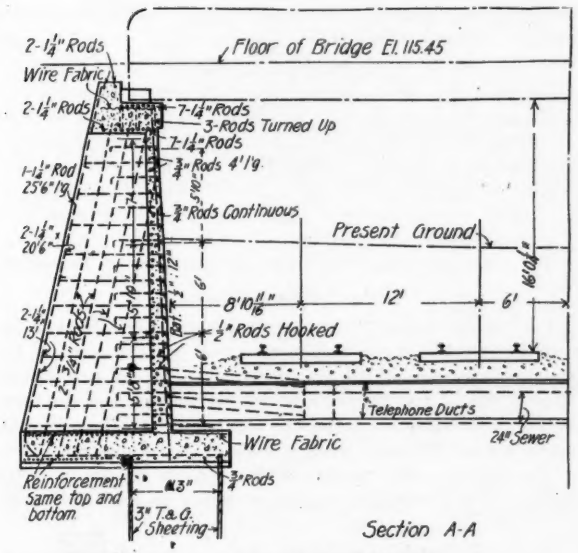
Plain Concrete Wing Abutment.

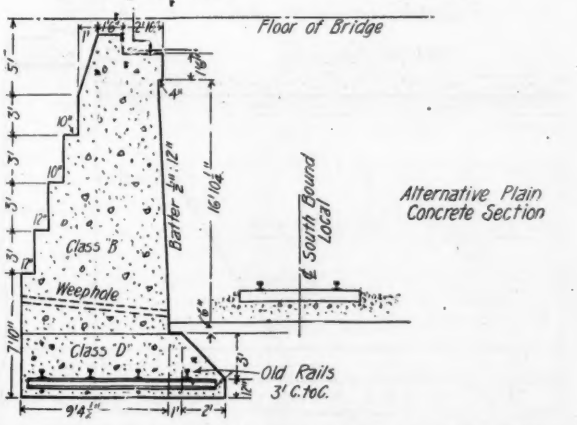


Plain Concrete Half "U" or "L" Abutment.

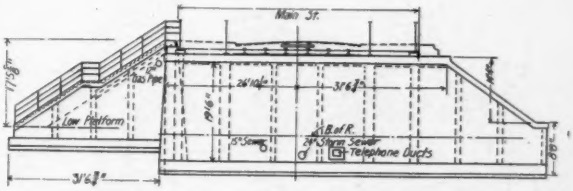


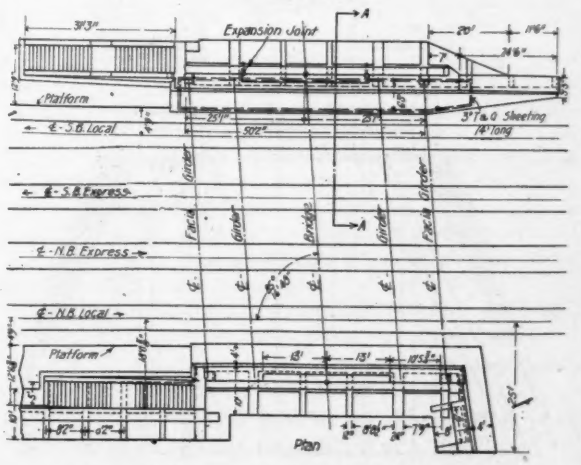
Location of Half "U" or "L" Abutment.



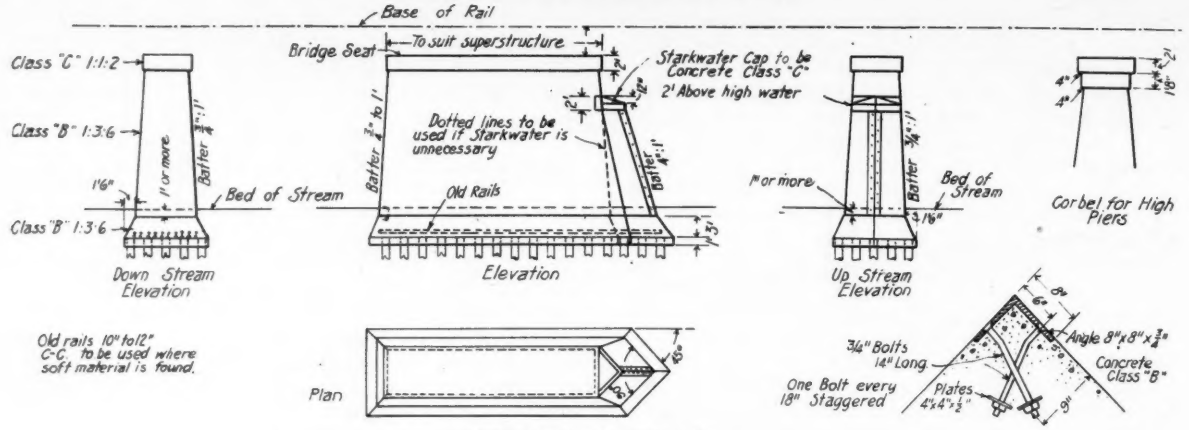


Reinforced Concrete Straight Abutment for Overhead Highway Bridge and Alternate Plain Concrete Section that Would Be Required.





Plan and Section of Overhead Highway Bridge.



Standard Plain Concrete Pier.

hesion of concrete to steel, 60 lbs. to the sq. in. Weep holes are 4-inch vitrified tile drain pipe.

All reinforcing rods are bent up at 90 degrees 2 inches from the end, and are placed at least 1 inch from face of concrete. The rods in the rear of the counterposts are continuous. A comparison of a section of the reinforced abutment with the corresponding section of a plain abutment for the same point shows the great saving of concrete in the reinforced design.

Standard Plain Concrete Pier.

The standard, plain concrete piers have a batter of ¾ inch to 1 foot. The starkweather is built up approximately 2 feet above high water. Class C concrete, 1:1:2 is used in the cap and the starkweather. Class B, 1:3:6, is used in the body and also in the footing. No. 8 galvanized wire netting with 1x2-inch mesh, or Clinton galvanized wire cloth with 3x8-inch mesh wire reinforcement is used in the top of bridge piers.

The foundations are made at least 4 ft. deep unless solid rock is found. The concrete is 1:3:6 mixture without rubble, unless local conditions make stone cheaper. If piles are required, the number is determined by local conditions; the required spread of foundation is made by a uniform slope instead of by steps.

A grillage of old rails is placed in the concrete just above the piles. Where splicing of these rails is necessary, the rails are fully bolted together, using two angle bars, breaking joints with the different rails.

Piers over 30 ft. high have a corbel course. Such a course is also used when the distance from the top of the starkweather to the coping is small. Piers over 40 ft. high are specially designed. For square spans, the following top widths of pier are required:

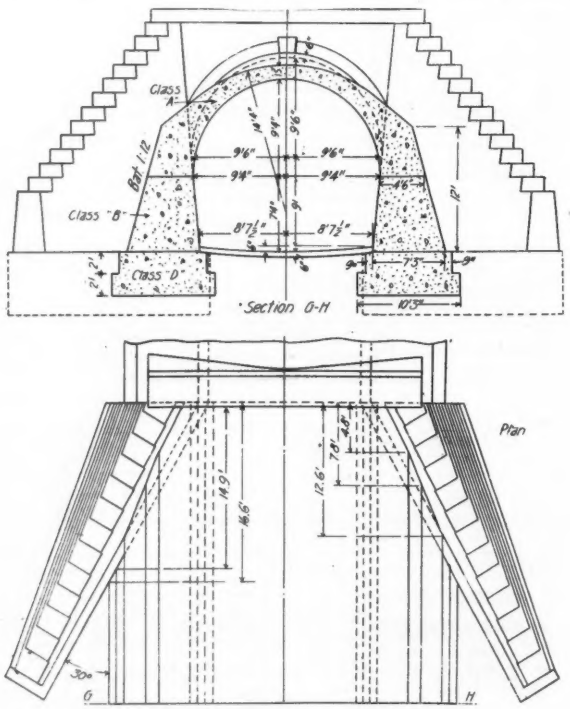
Spans up to 40 ft. high	Width, 4 ft. 0 ins.
Spans 40 to 60 ft. high	Width, 4 ft. 6 ins.
Spans 60 to 80 ft. high	Width, 5 ft. 0 ins.
Spans 80 to 100 ft. high	Width, 5 ft. 6 ins.
Spans 100 to 125 ft. high	Width, 6 ft. 0 ins.
Spans 125 to 150 ft. high	Width, 6 ft. 6 ins.
Spans 150 to 200 ft. high	Width 7 ft. 0 ins.
Spans 200 to 250 ft. high	Width, 7 ft. 6 ins.

For skew crossings the width is increased if necessary.

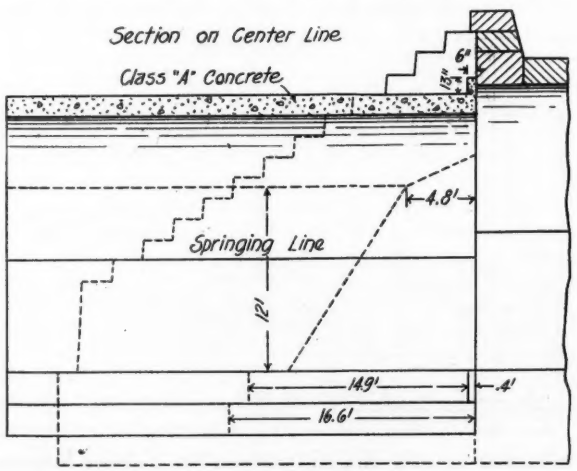
Plain Concrete Culvert.

The forces assumed in the design of the culvert illustrated herewith were: weight of earth, 100 lbs. per cu. ft.; weight of concrete, 150 lbs. per cu. ft.; inpact percentage, 30 per cent. Class D concrete, 1:4:7½ was used in the footings. Side walls to springing line were of Class B concrete, 1:3:6. The arch ring is class A, 1:2:4 mixture.

The ring is semi-circular with a crown thickness of 15 inches. The footing is stepped, 9 inches on each side, with



Plain Concrete Arch Culvert.



Section of Culvert on Center Line.

each 2-ft. rise. The inside and outside of the abutments are battered.

This structure was an extension to an old masonry culvert. The connection at the crown is a 6-inch wall, built to close the gap between the intrados of the old arch and the extrados of the new arch. Class A concrete was used in this portion.

Reinforced Concrete Cattle Pass.

In this structure class D, 1:4:7½ concrete was used in footings, class B, 1:3:6, was used in the side walls, class C, 1:1:2, was used in the slab and class A, 1:2:4, was used in the coping; the coarse aggregate was crushed stone. This cattle pass has a gravel ballast deck, with about 2 feet of ballast. The face of the abutments have a batter of 1 to 12. The back of abutment is stepped. The slab is reinforced with old rails as shown; 1024 ft. of rail was used weighing 12.4 tons. The slab has a pitch of 1 inch on each side from center to parapet wall. A similar pitch of one inch is provided parallel to track, from center of slab to abutment.

The back of abutments and wings are waterproofed from the top of the footings to coping. The cover is waterproofed between curbs. No ties are inserted to provide bond between the various parts of the structure.

(To be continued.)

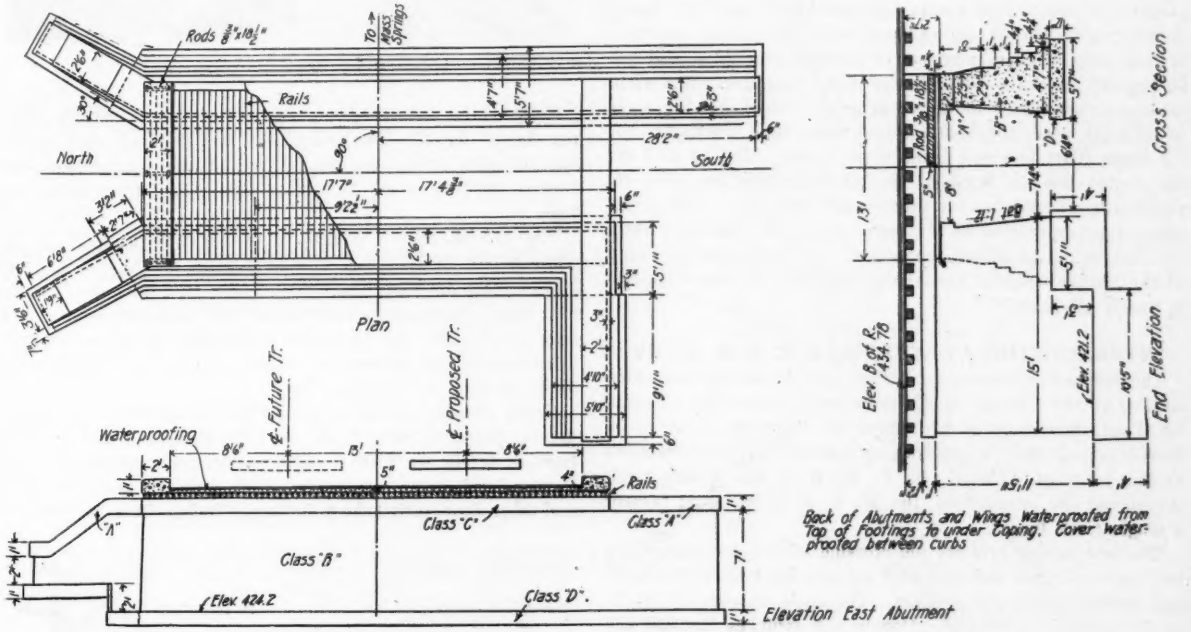
John Cook, and his son, C. W. Cook, both employed on the Central Kansas Division as passenger engineers, under the 25 years of service ruling are entitled to annual passes for themselves and wives.

In the territory from St. Louis south to the Arkansas line and from St. Louis west to Kansas City, considerably more than 500 men are affected. From Kansas City west, taking in the state of Kansas, something over 500 passes will be distributed, while in Arkansas and Louisiana about 300 employes will benefit by this courtesy.

R. W. Waters, a conductor on a suburban train running out of Saint Louis, is now in his 52d year of continuous employment. Beginning work for the Missouri Pacific before the Civil War, he has not changed employers, and is the oldest man in point of service on the entire system. He will receive a system pass for himself and wife.

The State R. R. Commission, of Wisconsin, has instructed the Chicago & Northwestern to construct a new viaduct over its tracks one-fourth mile north of Mendota Station, Dane County, Wis.

Bids will be received by the Fort Dodge, Des Moines & Southern, Boone, Ia., for the construction of a concrete substructure for a steel viaduct 2¼ miles north of Boone.



Plan and Section of Rail Top Cattle Pass.

ANNUAL PASSES ON THE MISSOURI PACIFIC.

As a reward for faithful service, the management of the Missouri Pacific-Iron Mountain Railroad has decided to issue annual passes to employes who have worked for that company fifteen years or longer.

About 1,500 employes will receive these passes, including agents, conductors, engineers, brakemen, train baggagemen, switchmen, firemen, hostlers, telegraphers, bridge and building foremen and section foremen.

The rules covering the extension of this courtesy to employes are: For fifteen years' continuous service an employe receives annual transportation for himself over the division on which he is employed; for twenty years' continuous service, an annual pass for himself and wife over the division, and after twenty-five years' continuous service annual transportation for himself and wife over the entire Missouri Pacific-Iron Mountain System of nearly 7,300 miles.

The work will include two abutments and 28 piers containing approximately 740 cu. yds. of concrete.

The Missouri, Kansas & Texas has let contracts for grading, filling preliminary to erecting a roundhouse, and other terminal improvements at East Waco, Tex., estimated to cost $300,000.

It is said that plans have been changed by the Chicago, Milwaukee & St. Paul for the proposed viaduct over the Des Moines river, west of Madrid, Ia., shortening the structure 1,000 ft.

The Pennsylvania Lines have prepared plans for a new office building and a machine shop at Cleveland, O.

The Pennsylvania R. R. will construct three underpasses at North Braddock, at a cost of about $175,000.

The Texas & Pacific is planning the reconstruction of its Westwego yards and the construction of a roundhouse and shops at Westwego, Tex.

The Signal Department

SIGNAL STANDARDS.

New York, Ontario & Western.

The first use of automatic block signals on the New York, Ontario & Western, was in 1888. The signals are two position, operating in the lower quadrant. The stroke of the blade is 60 to 75 degrees. The signals are normal clear, showing white for clear, green for caution, and red for stop. Both disk and semaphore signals are used. Semaphores are operated by motors; disks are uninclosed, operated by clockwork. The operating mechanism is located at the bottom of the post. Battery housings are of several types, namely: concrete and iron wells, concrete boxes, case at base of signal, and iron chutes. Gravity and potash batteries provide the current for operating the signals. The same battery provides current for line circuits and signal operation. Gravity battery is used in track circuits, with D. C. current track circuits with average length of one mile. The resistance of the D. C. relays is 4 to 9 ohms, all types being used. Overlaps are not used generally, but are used in some places. In some cases a separate pole line is used for signal circuits, with No. 12 copper clad wire. Common return is broken only in cases where it is deemed necessary, and not at regular intervals. Wooden or fibre wire ducts are used, located either below or above ground. The following sizes of wire are used: for bootlegs and leads from track, No. 10; for leads from line and leads from battery, No. 10 and 12; for chutes, No. 12 flexible. Switch indicators are used on practically all switches for single track; they are of the semaphore type, operating in the lower quadrant. Bracket posts are used in places where convenient. The standard drawings of the Railway Signal Association are used by this company in nearly all cases.

INTERLOCKING AT WYEVILLE, C. & N. W. RY.

The Milwaukee, Sparta & Northwestern, a recently completed section of the Chicago & Northwestern, crosses the Chicago, St. Paul, Minneapolis & Omaha at Wyeville, Wisconsin. A 64-lever, all electric interlocking machine has been installed at this junction. The C., St. P., M. & O. has double track throughout the interlocking, the M., S. & N. W. is at present a single track line.

The interlocking protects the crossing of the two main lines, and also operates switches and signals for two Wye tracks and the crossovers and switches. The angle between the tracks at the crossing is 50° 50′. Double slip switches 32-33-34 and switch 31 have No. 14 frogs. The rest of the turnouts are standard No. 10. The North Coast Limited, which originates on the Northern Pacific, is routed over the C., St. P., M. & O. through route 31, 34, 33, 32, around the Wye and onto the M. S. & N. W. main line. The No. 14 sharp frogs were used to give high speed over this route. The depot paltforms extend back to the Wye track so that trains stop at the station on the Wye track

The other Wye is evidently to be used chiefly for freight transfer, as it has no connection with the depot. The high speed derail 45 is located ahead of the switch in order to give the 500 ft. protection required by the Wisconsin law. If located back of the frog, the distance would have been less than that required. Derails 23 and 28 are extra derails, and are provided so that trains can pull up to the station past the first protecting derail and discharge passengers and baggage without interfering with movements over the crossing.

The non-interlocked switch just east of home signal 2, is a hand thrown switch, the switch lever also operating a side track derail by means of a pipe line. When open, this switch throws the distant signal to danger.

Home Signal, Wyeville Interlocking.

Two of the distant signals are located about 3,000 ft. from the home signal. The other two are located with reference to side track switches. Three of the annunciators are located 5,000 ft. from the distant signal, the others being out 7,000 ft.

The rail on the C., St. P., M. & O. is 90-lb. A. S. C. E. while on the M. S. & N. W. it is 90-lb. A. R. A. type B. The No. 14 frogs are plate frogs, that is, the frog rails are fastened to a heavy base plate extending several feet each side of the frog point. The No. 14 is also reinforced by two short rails fitted against and bolted to the wing rails, and extending the same distance as the frog plate.

Carter derails are used for all high speed routes, and Hayes derails, Model C, Style F, are used for low speed routes. Both types of derails are what is called continuous track derails. The Carter derail has an ordinary switch point on one side only, and when inoperative the point lays 5 inches from the straight

Signal Tower, Wyeville Interlocking.

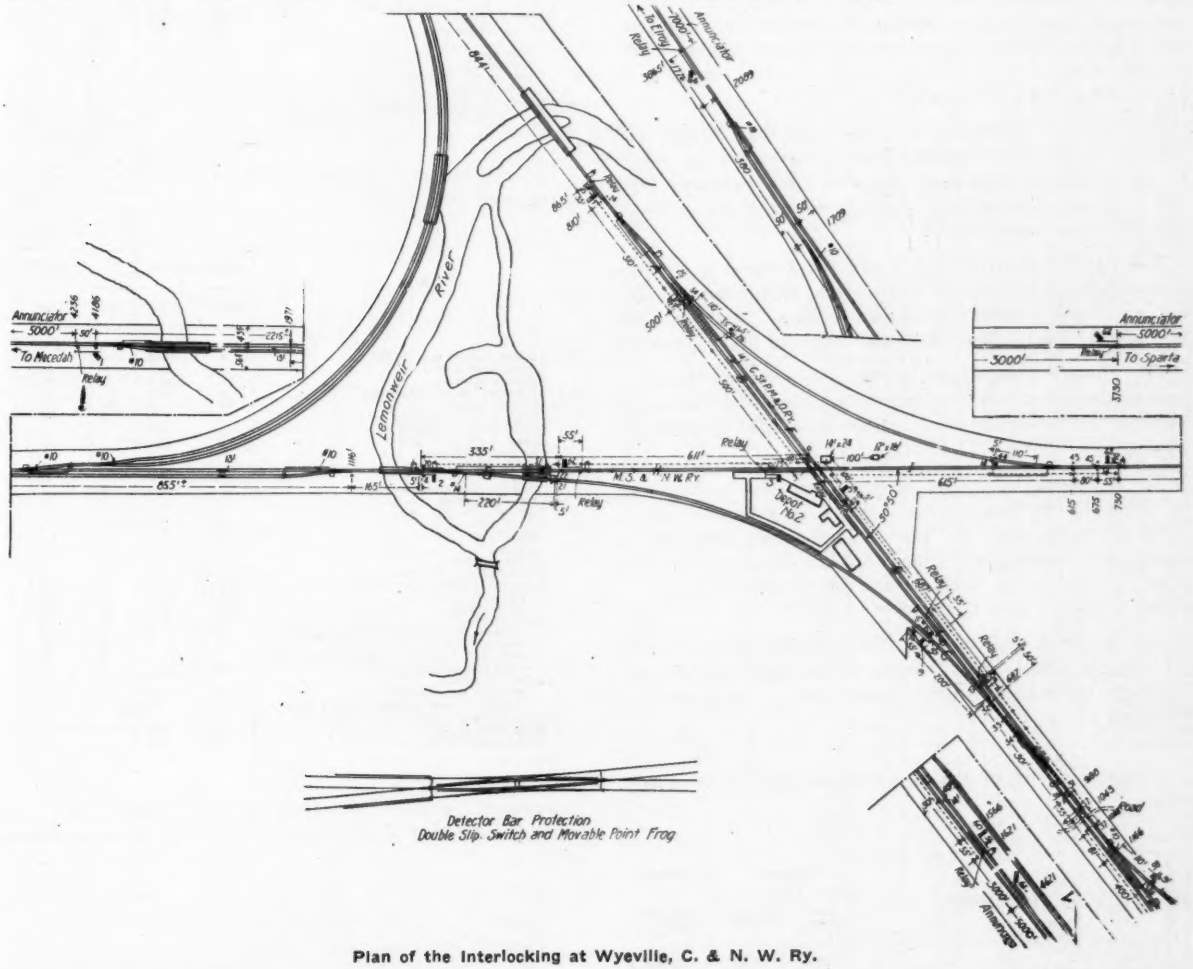
main track rail. On the opposite side of the track is a riser which works on arms, moving in conjunction with the switch point. When the point is thrown over against the main rail (derailing position) the riser moves up and rests on top of the main rail, on the opposite side. The riser lifts the wheel flange up over the rail, and the opposite wheel follows the point to the end of a short piece of rail back of it, and then both wheels drop to the ground. Long guard rails are provided back of the derails to hold the derailed train on the ties.

The distant signals are three position upper quadrant, and are slotted. The low speed signals operate from 0 to 45° only. Home signals are three position upper quadrant. All non-automatic signals are equipped so that they can be used as automatic signals when desired.

The tower is of red brick, with concrete floors. There is plenty of light and there are no obstructions in the line of vision of the towerman. Two double-arm hand-operated train order signals are located at the tower, governing traffic over both lines.

The interlocking machine is a 64-lever General Electric machine. The entire plant was installed by the General Electric Co. We are indebted to J. A. Peabody, signal engineer, for information used in this description.

City Engineer Tom Hurlburt, Portland, Ore., and officials of the Oregon-Washington R. R. & Navigation Co., have prepared plans for the construction of a viaduct over Sandy Hook crossing to cost $53,573.



Plan of the Interlocking at Wyeville, C. & N. W. Ry.

Trailing points are protected both by detector bars and detector circuits. Detector bars are provided for all other points and derails. Part of the conduits are of wood, others being loricated iron.

At 27 there are two derails operated by one machine, controlled by one lever. The location of switch 24 was such that the back up derail protecting it came close enough to the high speed derail protecting the crossing to permit these two to be located adjacent, thus saving one machine.

Home and dwarf signals are provided with electric lights, while distant signals have oil lights. The power for operating the plant is derived from a power house at the roundhouse and shops about ¼ mile north of the tower. Storage batteries in the basement of the tower are charged by a line from this power house, and furnish the current for the plant.

The Oregon-Washington R. R. & Navigation Co., and the Chicago, Milwaukee & Puget Sound, will jointly construct a 240-ft. single track steel draw bridge over the Chehalis River, between Montesano and South Montesano, Wash., in connection with about a mile and a half of new line.

It has been announced that the Pennsylvania will appropriate $40,000 for the removal of the old viaduct which crosses the Panhandle tracks near the old Sheriden borough line, Pittsburgh, Pa.

The Union Pacific is planning to spend $200,000 on improvements and new machinery at the Denver shops.

Bids have been taken for the construction of a steel and reinforced concrete viaduct over the Union Pacific and the Chicago, Rock Island & Pacific, at Kansas City, Kan. The structure will cost over $86,500.

BLOCK SIGNALS IN THE UNITED STATES, JANUARY 1, 1912.*

The total length of road in the United States operated under the block system on January 1, 1912, was 76,409.7 miles. Of this total, 20,334.9 miles were automatic and 56,074.8 miles were manual. There was an increase of 2,623.4 miles in the length of road covered by the automatic block system and an increase of 2,517.2 miles in the length of road covered by the manual block system over the figures shown in the bulletin of January 1, 1911. The total increase in the miles of road operated under the block system during the year was 5,140.6 miles.

The present report includes the following roads which have not heretofore reported the use of the block system: Arizona & New Mexico; Carolina & Northwestern; Chicago, Terre Haute & Southeastern; Copper Range; Denver & Rio Grande; Lake Erie & Pittsburg; New York, Chicago & St. Louis; New York, Philadelphia & Norfolk.

The Chicago, Burlington & Quincy and the Chicago, Milwaukee & St. Paul operate jointly 10.8 miles of double track covered by automatic signals. Each company owns one track; in these tables this installation is shown as double track for both companies.

The Atlanta & West Point and the Central of Georgia operate jointly 6 miles of double track, each company owning one track covered by manual signals. In these tables this installation is shown as double track for both companies.

The Illinois Central and the St. Louis & San Francisco operate jointly 35 miles of single track covered by automatic signals. In these tables this mileage is credited to both companies.

The Northern Pacific and the Great Northern operate jointly 60.3 miles of double track covered by automatic signals. Each company owns one track. The signals, however, are owned and maintained by the Northern Pacific Railway Co. This is operated as double track and is shown as such in these tables for both companies.

The Mobile & Ohio and the Illinois Central operate jointly 4.7 miles of double track covered by automatic signals, each company owning one track. This is shown as double track for both companies.

*From a report of the Block Signal and Train Control board.

Names of railroads.	Increase.		Decrease.
	Automatic.	Nonautomatic.	Nonautomatic.
	Miles.	*Miles.*	*Miles.*
Atchison, Topeka & Santa Fe's eastern lines	40.3	102.8	
Atlantic Coast Line			33.6
Baltimore & Ohio	49.6	1,827.2	
Boston & Maine	245.1		4.8
Buffalo, Rochester & Pittsburgh	35.1		38.3
Central New England	28.6		9.3
Chesapeake & Ohio	226.0		254.4
Chicago & Alton	44.3		
Chicago & Eastern Illinois		100.8	
Chicago, Burlington & Quincy	52.8		109.6
Chicago Great Western	177.3		1,242.3
Chicago, Indianapolis & Louisville	26.2		26.2
Chicago, Milwaukee & Puget Sound	248.2	275.3	
Cumberland Valley	36.7		8.5
Delaware, Lackawanna & Western	90.2		
Grand Trunk		1,131.1	
Great Northern	41.1		180.7
Illinois Traction	76.0		24.0
Louisville & Nashville			239.6
Missouri Pacific	6.9	452.5	
St. Louis, Iron Mountain & Southern		355.3	
New York Central & Hudson River	192.8		
Norfolk & Western	108.1		86.7
Northern Pacific	201.9		74.9
Northwestern Pacific	11.9		250.5
Pennsylvania	4.5	414.3	
Pennsylvania Co.	172.3		171.8
Philadelphia, Baltimore & Washington		272.6	
Queen & Crescent—New Orleans & Northeastern	77.9		
St. Louis & San Francisco	133.6		49.0
Southern Pacific—Pacific System	86.5		
Union Pacific	38.9		

Comparing the present report with the report for January 1, 1911, the following notable changes appear, the figures in each case representing miles of road:

The use of alternating current in signal-operating circuits and in track circuits is reported as follows:

Road.	Signal circuit.		Track circuit.	
	Road.	Track.	Road.	Track.
	Miles.	*Miles.*	*Miles.*	*Miles.*
Atchison, Topeka & Santa Fe	32.6	65.2	32.6	65.2
Boston & Maine	2.8	5.6		
Chicago, Milwaukee & St. Paul	5.0	10.0		
Chicago, Rock Island & Pacific	3.5	7.0	3.5	7.0
Cumberland Valley	43.4	81.9	43.4	81.9
Illinois Traction	76.0	76.0	76.0	76.0
Long Island		62.6		84.1
New York Central & Hudson River	44.8	147.7	53.1	180.9
New York, New Haven & Hartford		181.4		157.2
Norfolk & Western	50.6	101.2		
Northwestern Pacific	25.8	38.2	25.8	38.2
Pennsylvania	11.3	22.5	35.3	111.6
West Jersey & Seashore			35.5	71.0
Northern Central			.7	1.4
Philadelphia, Baltimore & Washington	2.6	3.9	2.6	5.2
Pittsburgh, Cincinnati, Chicago & St. Louis			.5	1.0
Southern Pacific—Pacific System			3.3	9.6
San Francisco, Oakland & San Jose Consolidated	3.8	7.6	3.8	7.6

The use of upper quadrant and three-position block signals is reported as follows:

Road.	Upper quadrant.		Three position.	
	Road.	Track.	Road.	Track.
	Miles.	*Miles.*	*Miles.*	*Miles.*
Atchison, Topeka & Santa Fe	3.8	3.8	3.8	3.8
Atlantic Coast Line	14.1	28.2	14.1	28.2
Baltimore & Ohio	267.7	555.9	177.2	421.3
Baltimore & Ohio Southwestern	24.8	49.6	24.8	49.6
Boston & Albany	128.2	334.1	128.2	334.1
Chicago & Eastern Illinois			98.4	196.8
Chicago & North Western	3.6	14.8	3.6	14.8
Chicago & Western Indiana	1.7	3.4	19.5	39.0
Chicago Great Western	61.6	123.2	61.6	123.2
Chicago, Milwaukee & St. Paul	248.2	248.2	248.2	248.2
Chicago, Rock Island & Gulf	32.6	32.6	32.6	32.6
Cincinnati, Hamilton & Dayton	36.3	53.4	36.3	53.4
Cumberland Valley	43.4	81.9	43.4	81.9
Delaware & Hudson	1.6	1.6		
Illinois Traction	76.0	76.0	76.0	76.0
Lehigh Valley	69.3	145.8	69.3	145.8
Long Island	12.0	49.0	12.0	49.0
Michigan Central	7.4	14.8	7.4	14.8
Missouri, Kansas & Texas	6.0	6.8	6.0	6.8
New York Central & Hudson River	352.8	670.5	352.8	670.5
Norfolk & Western	281.3	502.3	281.3	502.3
Northern Pacific	261.9	523.8	261.9	523.8
Pennsylvania	17.1	42.9	17.1	42.9
Philadelphia, Baltimore & Washington	12.8	25.7	12.8	25.7
Pennsylvania Co.			465.5	1,052.2
Pittsburgh, Cincinnati, Chicago & St. Louis			13.7	34.4
West Jersey & Seashore	18.4	36.8	18.4	36.8
Queen & Crescent:				
Alabama Great Southern	34.0	34.4	34.0	34.4
Cincinnati, New Orleans & Texas Pacific	1.9	3.8	1.9	3.8
St. Louis Merchants' Bridge Terminal			5.9	11.8
Washington Southern	5.6	14.2	5.6	14.2
Washington Terminal	2.1	20.4	2.1	20.4

Railroad companies have reported the following additions to existing signal installations proposed to be made during 1912:

Automatic:	Miles.
Atchison, Topeka & Santa Fe	31.2
Central New England	2.2
Chicago, Indianapolis & Louisville	295
Cumberland Valley	20
Delaware, Lackawanna & Western	53.9
Illinois Central	12.8
Illinois Traction	10
Long Island	10
Maine Central	36.3
Portland Terminal	1.8
New York, New Haven & Hartford	69.3
New York, Ontario & Western	31.2
Southern	11.2
Southern Pacific: Pacific System	88.4
Union Pacific	16.6
West Jersey & Seashore	144.4
Nonautomatic:	
Pennsylvania Co.	31.8

Table No. 1.

AGGREGATE LENGTH OF LINES AND PARTS OF LINES ON WHICH THE BLOCK SYSTEM WAS IN USE ON JANUARY 1, 1912.

Names of railroads.	Automatic block signals.						Nonautomatic block signals.						Total automatic and nonautomatic.		Total passenger lines operated.		Percentage block signaled, miles of track.
	Single track.	Double track.	Three track.	Four track.	Total. Miles of road.	Total. Miles of track.	Single track.	Double track.	Three track.	Four track.	Total. Miles of road.	Total. Miles of track.	Miles of road.	Miles of track.	Miles of road.	Miles of track.	
Ann Arbor							1.0				1.0	1.0	1.0	1.0	292.0	292.0	0.3
Arizona and New Mexico	1.0				1.0	1.0							1.0	1.0	109.0	109.0	.9
Atchison, Topeka & Santa Fe:																	
Eastern lines	7.7	111.9			119.6	231.5	444.2	508.2			952.4	1,460.6	1,072.0	1,092.1	2,455.4	3,052.9	53.9
Western lines	3.8	2.5			6.3	8.8	541.7	23.8			565.5	589.3	571.8	598.1	2,856.2	2,882.4	20.7
Coast lines	9.0	22.2			31.2	53.4	4.3				4.3	4.3	35.5	57.7	1,878.5	1,985.2	2.9
Gulf, Colorado & Santa Fe	2.9				2.9	2.9	2.2				2.2	2.2	5.1	5.1	1,621.4	1,621.4	.3
Atlanta & West Point							6.0	6.0			6.0	12.0	6.0	12.0	86.0	92.0	13.0
Atlantic Coast Line	2.4	14.1			16.5	30.6	359.7	81.5			441.2	522.7	457.7	553.3	3,830.8	3,958.3	14.0
Auburn & Northern	6.5				6.5	6.5							6.5	6.5	6.5	6.5	100.0
Baltimore & Ohio	1.9	253.1		12.7	267.7	558.9	2,044.0	702.5	117.9	9.5	2,873.9	3,840.7	3,141.6	4,399.6	3,139.0	4,289.6	100.0
Baltimore & Ohio Chicago Terminal	1.2	11.2			12.4	23.0							12.4	23.0	45.8	73.0	31.5
Baltimore & Ohio Southwestern		24.8			24.8	49.6	910.6	44.7			955.3	1,000.0	980.1	1,049.6	980.1	1,049.6	100.0
Baltimore & Sparrow Point							1.7	3.0			4.7	7.7	4.7	7.7	4.7	7.7	100.0
Bessemer & Lake Erie.[1]							63.8	130.6			194.4	325.0	194.4	325.0	191.0	321.5	97.2
Boston & Maine	348.9	591.2		2.1	942.2	1,539.7							942.2	1,539.7	2,238.6	2,801.6	54.9
Boston, Revere Beach & Lynn		13.8			13.8	27.6							13.8	27.6	13.8	27.6	100.0
Buffalo, Rochester & Pittsburgh		35.1			35.1	70.2	295.1	96.5			391.6	488.0	426.7	558.2	426.7	558.2	100.0
Butte, Anaconda & Pacific	7.9				7.9	7.9							7.9	7.9	25.3	25.3	31.2
Carolina & Northwestern							6.1				6.1	6.1	6.1	6.1	133.5	133.5	4.5
Central New England[2]	12.9	15.7			28.6	44.3	6.7				6.7	6.7	35.3	51.0	276.8	302.2	16.9
Central of Georgia							52.3	7.4			59.7	59.7	59.7	59.7	1,915.9	1,915.9	3.1
Central of New Jersey	13.0	165.5	2.4	31.5	212.4	477.2							212.4	477.2	464.1	742.9	64.2
Chesapeake & Ohio		409.0			409.0	818.0	1,086.2	59.5			1,145.7	1,205.2	1,554.7	2,023.2	1,602.8	2,070.7	97.7
Chesapeake & Ohio Ry. of Indiana							262.2				262.2	262.2	262.2	262.2	262.2	262.2	100.0
Chicago & Alton	420.7	184.6			605.3	789.9	141.2				141.2	141.2	746.5	931.1	1,025.2	1,209.8	72.8
Chicago & Eastern Illinois		98.4			98.4	196.8	277.0	55.2			332.2	387.4	430.6	584.2	972.7	1,131.2	51.6
Chicago & North Western[3]		722.1	12.8	8.4	743.3	1,516.6	2,413.3	115.3			2,528.6	2,643.9	3,271.9	4,160.5	6,979.8	7,897.3	52.8
Milwaukee, Sparta & North Western							139.9	6.3			146.2	152.5	146.2	152.5	154.3	168.7	90.4
Chicago & Western Indiana		19.5			19.5	39.0		4.6	3.2		7.8	18.8	27.3	57.8	27.3	57.8	100.0
Chicago, Burlington & Quincy[4]	44.6	43.6	1.6	5.4	95.2	158.2	7,922.6	942.5	17.1		8,582.2	9,258.9	8,677.4	9,417.1	8,422.2	9,171.1	100.0
Chicago Great Western	197.0	86.2			283.2	369.4	88.6				88.6	88.6	371.8	458.0	1,470.7	1,566.7	29.2
Chicago, Indianapolis & Louisville	26.2				26.2	26.2	498.7				498.7	498.7	524.9	524.9	578.0	578.0	90.9
Chicago, Milwaukee & St. Paul	5.9	103.7			109.6	243.3	3,300.5	478.4			3,778.9	4,257.3	3,888.5	4,470.6	6,048.1	6,628.1	67.5
Chicago, Milwaukee & Puget Sound	248.2				248.2	248.2	1,640.0				1,640.0	1,640.0	1,888.2	1,888.2	1,943.1	1,943.1	97.2
Tacoma & Eastern							129.0				129.0	129.0	129.0	129.0	129.0	129.0	100.0
Chicago, Peoria & St. Louis Ry. of Ill	1.3				1.3	1.3							1.3	1.3	237.0	237.0	.5
Chicago, Rock Island & Pacific	653.3	283.1			936.4	1,219.5	997.7				997.7	997.7	1,934.1	2,217.2	6,682.7	6,974.4	31.8
Chicago, Rock Island & Gulf	32.6				32.6	32.6							32.6	32.6	468.9	468.9	6.9
Chicago, St. Paul, Minneapolis & Omaha		6.2			6.2	12.4	549.6	104.5			654.1	758.5	660.3	770.9	1,527.1	1,645.5	46.9
Chicago, Terre Haute & Southeastern	1.5				1.5	1.5							1.5	1.5	351.1	367.6	.4
Cincinnati, Hamilton & Dayton	19.2	17.1			36.3	53.4	16.0	17.9			33.9	51.8	70.2	105.2	527.9	579.5	18.6
Cincinnati, Indianapolis & Western							99.0				99.0	99.0	99.0	99.0	360.9	360.9	27.4
Colorado Midland							2.0				2.0	2.0	2.0	2.0	261.1	261.1	.8
Copper Range							74.6				74.6	74.6	74.6	74.6	81.6	81.6	91.4
Cornwall & Lebanon							8.3	13.7			22.0	35.7	22.0	35.7	22.0	35.7	100.0
Cumberland & Pennsylvania							4.3		3.0		7.3	13.3	7.3	13.3	31.3	34.8	38.2
Cumberland Valley	4.9	38.5			43.4	81.9	11.1				11.1	11.1	54.5	93.0	162.2	206.9	44.9
Delaware & Hudson	164.7	225.9	4.3	17.5	412.4	699.5							412.4	699.5	743.9	1,042.4	55.4
Delaware, Lackawanna & Western	164.3	458.1	44.6	7.9	674.9	1,245.7	9.7				9.7	9.7	684.6	1,255.4	985.3	1,573.7	79.8
Denver and Rio Grande							7.7				7.7	7.7	7.7	7.7	2,247.3	2,406.7	.3
Duluth & Iron Range[5]		16.1			16.1	17.9							16.1	17.9	300.5	270.6	6.6
Durham & Southern							56.0				56.0	56.0	56.0	56.0	56.0	56.0	100.0
Elgin, Joliet & Eastern	2.0	3.0			5.0	8.0	11.3				11.3	11.3	16.3	19.3	218.7	278.5	7.0
Erie		213.3		14.8	228.1	485.8	521.0	551.7			1,072.7	1,694.4	1,300.8	2,110.2	1,704.4	2,513.8	84.3
Chicago & Erie							240.4	8.4			248.8	257.2	248.8	257.2	248.8	257.2	100.0
Columbus & Erie							12.6	9.8			22.4	32.2	22.4	32.2	22.4	32.2	100.0
Erie & Jersey		42.3			42.3	84.6							42.3	84.6	Freight line		
Genesee River							32.6				32.6	32.6	32.6	32.6	32.6	32.6	100.0
New Jersey & New York		10.5			10.5	21.0	26.1				26.1	26.1	36.6	47.1	51.8	61.3	76.8
New York, Susquehanna & Western							16.0	13.7			29.7	43.4	29.7	43.4	203.4	217.1	20.0
Evansville & Terra Haute							105.8				105.8	105.8	105.8	105.8	143.3	143.3	73.8
Grand Trunk	1.1	1.6			2.7	4.3	807.6	323.5			1,131.1	1,454.6	1,133.8	1,458.9	1,133.8	1,458.9	100.0
Great Northern	9.9	162.0			171.9	333.9	77.8				77.8	77.8	249.7	411.7	7,088.8	7,290.0	5.6
Hocking Valley							138.4				138.4	138.4	138.4	138.4	338.0	338.0	36.2
Hudson & Manhattan[6]	3.0	7.9			10.9	18.8							10.9	18.8	10.9	18.8	100.0
Illinois Central[3]	65.1	235.1		12.0	312.2	621.0	7.0	5.0			12.0	17.0	324.2	638.0	4,462.7	5,027.2	12.7
Yazoo & Mississippi Valley	6.6				6.6	6.6		6.3			6.3	12.6	12.9	19.2	1,193.0	1,200.7	1.6
Illinois Traction	76.0				76.0	76.0							76.0	76.0	418.8	419.8	18.1
Iowa Central							11.0				11.0	11.0	11.0	11.0	503.0	503.0	2.2
Kanawha & Michigan	1.8				1.8	1.8	2.3				2.3	2.3	4.1	4.1	163.9	163.9	.3
Kentucky & Indiana Bridge & R. R. Co.							4.8	5.8	0.5		11.1	17.9	11.1	17.9	11.1	17.9	100.0
Kentwood & Eastern							3.3				3.3	3.3	3.3	3.3	30.0	30.0	11.0
Lackawanna & Wyoming Valley							1.0	2.4			3.4	5.8	3.4	5.8	22.6	43.4	13.3
Lehigh & New England	.7				.7	.7							.7	.7	67.2	67.2	
Lehigh Valley	14.1	447.5	34.9	24.1	520.6	1,110.0	645.7	51.9			697.6	749.5	1,218.2	1,859.5	1,178.0	1,779.3	100.0
Long Island	4.0	106.1	3.3	8.8	122.2	261.3		22.7			22.7	45.4	144.9	306.7	391.9	549.5	55.8
Louisville & Nashville	21.1	18.0			39.1	57.1	170.8	65.5			236.3	301.8	275.4	358.9	4,232.2	4,402.9	8.2

[1] (Bessemer & Lake Erie.) The figures shown include 8.9 miles of road on which no passenger trains are run.
[2] (Central New England.) 4.2 miles of track on which automatic and controlled manual signals are installed.
[3] (Chicago & North Western, Illinois Central, New York, New Haven & Hartford, Pennsylvania, Washington Terminal.) Include road with more than four tracks.
[4] (Chicago, Burlington & Quincy.) On 480.1 miles of road on which only one engine is in regular service, the block system is used whenever more than one engine is used, the rules and practices being such that the block system is introduced on the simple knowledge of an additional train being in service.
[5] (Duluth & Iron Range.) Signals are installed on only one track of 14.3 miles of double-track road.
[6] (Hudson & Manhattan.) Light signals; not shown in Table 2.

Table No. 1—Continued.

AGGREGATE LENGTH OF LINES AND PARTS OF LINES ON WHICH THE BLOCK SYSTEM WAS IN USE ON JANUARY 1, 1912—Continued.

Names of railroads.	Automatic block signals.						Nonautomatic block signals.						Total automatic and nonautomatic.		Total passenger lines operated.		Percentage block signaled, miles of track.
	Single track.	Double track.	Three track.	Four track.	Total. Miles of road.	Total. Miles of track.	Single track.	Double track.	Three track.	Four track.	Total. Miles of road.	Total. Miles of track.	Miles of road.	Miles of track.	Miles of road.	Miles of track.	
Maine Central	419.9	57.6			477.5	[3] 535.1							477.5	535.1	1,130.1	1,187.7	45.1
Portland Terminal	3.1	11.5			14.6	26.1							14.6	26.1	22.1	32.7	79.8
Minneapolis, St. Paul & Sault Ste. Marie							2,444.8	4.4			2,449.2	2,453.6	2,449.2	2,453.6	3,429.2	3,433.6	71.5
Missouri, Kansas & Texas	8.4	.8			9.2	10.0	9.5				9.5	9.5	18.7	19.5	2,885.9	2,886.7	.7
Missouri Pacific	54.5	33.3			87.8	120.1	465.7	5.4			471.1	476.5	558.9	596.6	3,736.8	3,790.5	13.1
St. Louis, Iron Mountain & Southern	113.8	9.4			123.2	131.8	315.2	52.8			368.0	420.8	491.2	552.6	3,100.1	3,259.2	17.0
Mobile & Ohio		4.7			4.7	9.4	51.9				51.9	51.9	56.6	61.3	827.0	827.0	6.9
Monongahela	.5				.5	.5							.5	.5	66.7	66.7	.7
Munising, Marquette & Southeastern							3.7				3.7	3.7	3.7	3.7	145.5	145.5	2.5
Nashville, Chattanooga & St. Louis							92.8	11.8			104.6	116.4	104.6	116.4	1,230.1	1,241.9	9.3
Newburgh & South Shore							.1	5.2			5.3	10.5	5.3	10.5	Freight line		
New York & Long Branch		38.0			38.0	76.0							38.0	76.0	38.0	76.0	100.0
New York Central lines:																	
Boston & Albany		132.9	50.1	23.6	206.6	510.5		1.9			1.9	3.8	208.5	514.3	386.7	607.6	84.6
Chicago, Indiana & Southern		5.0			5.0	10.0	144.1	59.1			203.2	262.3	208.2	272.3	421.3	540.5	50.3
Cleveland, Cincinnati, Chicago & St. Louis	2.3				2.3	2.3	542.6	379.0			921.6	1,300.6	923.9	1,302.9	1,865.4	2,283.2	58.0
Lake Erie & Western							862.8	9.2			872.0	881.2	872.0	881.2	832.5	841.5	100.0
Lake Shore & Michigan Southern	8.5	181.1	113.4	234.4	537.4	1,646.6	961.8	85.9			1,047.7	1,132.8	1,585.1	2,779.4	1,452.9	2,587.7	100.0
Dunkirk, Allegheny Valley & Pittsburgh							90.5				90.5	90.5	90.5	90.5	90.5	90.5	100.0
Lake Erie & Pittsburgh							27.8				27.8	27.8	27.8	27.8	Freight line		
Lake Erie, Alliance & Wheeling							87.7				87.7	87.7	87.7	87.7	87.7	87.7	100.0
Michigan Central[1]		271.9			271.9	543.8	901.0	19.3			920.3	939.6	1,192.2	1,483.4	1,192.2	1,483.4	100.0
New York Central & Hudson River	1.9	505.8		66.6	574.3	1,279.9	1,597.9	867.4	15.5		2,480.8	3,379.1	3,055.1	4,659.0	3,085.8	4,722.9	98.7
Peoria & Eastern							84.0	1.7			85.7	87.4	85.7	87.4	337.9	340.3	25.7
Pittsburgh & Lake Erie		102.4		49.3	151.7	402.0	2.7				2.7	2.7	154.4	404.7	166.2	418.1	96.8
New York, Chicago & St. Louis	15.4				15.4	15.4							15.4	15.4	523.0	523.0	2.9
New York, New Haven & Hartford[2]	17.5	264.3		9.2	291.0	601.3	154.3	205.7		75.8	435.8	868.9	726.8	1,470.2	1,958.1	3,120.2	47.1
New York, Ontario & Western	36.0	132.5			168.5	301.0							168.5	301.0	492.8	626.2	48.1
New York, Philadelphia & Norfolk		8.8			8.8	17.6	43.6	40.0			83.6	123.6	92.4	141.2	112.0	160.7	87.8
Norfolk & Western	70.7	376.2			446.9	833.1	1,217.6	7.1			1,224.7	1,231.8	1,671.6	2,064.9	1,695.0	2,081.5	98.6
Northern Pacific	101.5	338.6			440.1	778.7	781.6	137.0			918.6	1,055.6	1,358.7	1,834.3	5,397.9	5,868.9	31.3
Northwestern Pacific	13.4	12.4			25.8	38.2							25.8	38.2	383.2	395.9	9.8
Pennsylvania[3]		60.0	3.1	204.3	267.4	949.9	1,884.9	673.2	23.8	191.9	2,775.8	4,113.1	3,043.2	5,063.0	3,217.2	5,237.5	95.0
Cleveland, Akron & Cincinnati							137.7	17.5			155.2	172.7	155.2	172.7	325.8	343.3	50.3
Grand Rapids & Indiana							55.8	2.2			58.0	60.2	58.0	60.2	532.5	543.1	11.1
Northern Central							286.7	121.9		18.8	427.4	605.7	427.4	605.7	635.0	616.9	98.2
Pennsylvania Co.		442.7	21.2	52.7	516.6	1,159.8	398.6	173.1	4.0	1.6	577.3	763.2	1,093.9	1,923.0	2,314.8	2,164.0	89.0
Philadelphia, Baltimore & Washington		15.5		21.0	36.5	115.1	426.4	146.7	14.6	18.7	606.5	838.4	643.0	953.5	646.0	956.8	99.6
Pittsburgh, Cincinnati, Chicago & St. Louis		10.2		3.5	13.7	34.4	489.9	515.3	59.2	34.9	1,099.3	1,537.7	1,113.0	1,572.1	1,415.6	2,174.5	86.0
West Jersey & Sea Shore		87.1	6.0		93.1	192.2	48.9	31.8			80.7	112.5	173.8	304.7	318.2	455.6	66.9
Vandalia							300.9	60.9			361.8	422.7	361.8	422.7	797.1	868.2	48.7
Peoria & Pekin Union								6.5			6.5	13.0	6.5	13.0	15.2	24.2	53.7
Pere Marquette	15.2				15.2	15.2	39.0				39.0	39.0	54.2	54.2	1,534.2	1,539.6	3.4
Philadelphia & Reading[3]	14.5	326.7	38.9	22.6	402.7	875.0	143.2	96.2			239.4	335.6	642.1	1,210.6	870.0	1,461.9	81.2
Atlantic City		86.8			86.8	173.6	35.9				35.9	35.9	122.7	209.5	164.0	251.9	83.2
Gettysburg & Harrisburg							24.2				24.2	24.2	24.2	24.2	31.0	31.0	78.1
Northeast Pennsylvania	2.8	2.0			4.8	6.8	1.6				1.6	1.6	6.4	8.4	25.6	27.6	30.4
Perkiomen							38.2				38.2	38.2	38.2	38.2	38.2	38.2	100.0
Philadelphia, Newton & New York	3.8	1.7	1.6		7.1	12.0							7.1	12.0	21.7	26.6	45.1
Reading & Columbia							34.9				34.9	34.9	34.9	34.9	53.3	53.3	65.5
Quincy, Omaha & Kansas City, and Iowa & St. Louis							307.7				307.7	307.7	307.7	307.7	307.7	307.7	100.0
Queen & Crescent Route:																	
Alabama Great Southern	108.1	.4			108.5	108.9							108.5	108.9	290.5	297.6	37.5
Cincinnati, New Orleans & Texas Pacific	263.3	70.8			334.1	404.9	.7				.7	.7	334.8	405.6	335.4	406.2	99.8
New Orleans & Northeastern	77.9	15.5			93.4	108.9							93.4	108.9	195.6	211.1	51.6
Richmond, Fredericksburg & Potomac							9.0	78.7			87.7	166.4	87.7	166.4	87.7	166.4	100.0
St. Joseph & Grand Island							.3				.3	.3	.3	.3	251.6	251.6	
St. Louis & San Francisco	695.9	37.8			733.7	771.5	108.3				108.3	108.3	842.0	879.8	4731.9	4806.5	18.3
Beaumont, Sour Lake & Western							84.3				84.3	84.3	84.3	84.3	118.3	118.3	71.3
New Orleans, Texas & Mexico							158.7				158.7	158.7	158.7	158.7	264.3	264.3	60.1
Orange & Northwestern							61.6				61.6	61.6	61.6	61.6	61.6	61.6	100.0
St. Louis, Merchants Bridge Terminal		5.9			5.9	11.8		1.1			1.1	2.2	7.0	14.0	10.0	19.8	70.7
St. Louis Southwestern	.4				.4	.4							.4	.4	649.2	649.2	.1
San Francisco, Oakland & San Jose Consolidated		3.8			3.8	7.6							3.8	7.6	18.0	35.4	21.1
San Pedro, Los Angeles & Salt Lake	3.7				3.7	3.7							3.7	3.7	963.7	963.7	.4
Seaboard Air Line							213.5				213.5	213.5	213.5	213.5	2,820.5	2,820.5	7.5
Southern		3.0			3.0	6.0	1,562.3	273.1			1,835.4	2,108.5	1,838.4	2,114.5	6,616.7	6,952.2	30.4
Southern Illinois & Missouri Bridge		4.6			4.6	9.2							4.6	9.2	4.6	9.2	100.0
Southern Pacific Atlantic System:																	
Galveston, Harrisburg & San Antonio	279.1	[4]			279.1	279.1							279.1	279.1	1,270.3	1,274.7	21.9
Louisiana Western	103.6				103.6	103.6							103.6	103.6	140.5	140.5	73.8
Morgan's Louisiana & Texas	95.3				95.3	95.3							95.3	95.3	292.6	332.8	28.6
Texas & New Orleans	109.8				109.8	109.8							109.8	109.8	438.4	438.4	24.9
Southern Pacific, Pacific System	2,266.3	172.8		2.5	2,441.6	2,621.9	87.0	11.0			98.0	109.0	2,539.6	2,730.9	6,497.9	6,731.9	42.0
Spokane, Portland & Seattle	.5	6.8			7.3	14.1							7.3	14.1	505.6	515.6	2.7
Staten Island Rapid Transit		10.1		.6	10.7	21.3							10.7	21.3	10.7	21.3	92.5
Staten Island		1.8			1.8	3.6	2.5	8.4			10.9	19.3	12.7	22.9	12.7	22.9	100.0
Syracuse, Lake Shore & Northern		6.5			6.5	13.0							6.5	13.0	33.0	44.5	27.6
Terminal R. R. Assn., of St. Louis		6.0			6.0	12.0		1.1			1.1	2.2	7.1	14.2	12.7	25.4	55.9
Tidewater Power Co.							6.2				6.2	6.2	6.2	6.2	11.3	15.7	39.5
Toledo, Peoria & Western							.3				.3	.3	.3	.3	220.0	220.0	.1
Toledo, St. Louis & Western							172.0				172.0	172.0	172.0	172.0	450.0	450.0	38.2
Ulster & Delaware	24.4				24.4	24.4							24.4	24.4	126.3	126.3	19.8

[1] (Michigan Central.) 244.8 miles double track automatic signals in Canada not shown in these tables.
[2] (Chicago & North Western, Illinois Central, New York, New Haven & Hartford, Pennsylvania, Washington Terminal.) Include road with more than four tracks.
[3] (Philadelphia & Reading.) The figures shown include 15.8 miles of road, 25.9 miles of track, used exclusively for freight service.

Table No. 1- Continued

AGGREGATE LENGTH OF LINES AND PARTS OF LINES ON WHICH THE BLOCK SYSTEM WAS IN USE ON JANUARY 1, 1912—Continued.

Names of railroads.	Automatic block signals.						Nonautomatic block signals.						Total automatic and nonautomatic.		Total passenger lines operated.		Percentage block signaled, miles of track.
	Single track.	Double track.	Three track.	Four track.	Total. Miles of road.	Total. Miles of track.	Single track.	Double track.	Three track.	Four track.	Total. Miles of road.	Total. Miles of track.	Miles of road.	Miles of track.	Miles of road.	Miles of track.	
Union		0.6			0.6	1.2	1.4				1.4	1.4	2.0	2.6	7.4	14.8	24.3
Union Pacific	766.8	684.1		1.7	1,432.6	2,139.8	11.4				11.4	11.4	1,464.0	2,151.2	3,506.5	4,210.9	51.1
Oregon-Washington R. R. & Navigation Co	424.9	13.6			438.5	452.1	1.3				1.3	1.3	439.8	453.4	1,427.3	1,445.6	31.3
Oregon Short Line	541.2	36.0			577.2	613.2							577.2	613.2	1,457.6	1,497.6	41.0
Virginia & Kentucky							.6				.6	.6	.6	.6	4.8	4.8	12.5
Virginian							17.3				17.3	17.3	17.3	17.3	460.0	460.0	3.8
Wabash		13.2			13.2	26.4	1,726.7	88.0			1,814.7	1,902.7	1,827.9	1,929.1	1,954.9	2,056.1	93.8
Wabash-Pittsburg Terminal		4.1			4.1	8.2							4.1	8.2	59.8	63.9	12.8
Washington Southern		4.1		1.5	5.6	14.2		26.6			26.6	53.2	32.2	67.4	32.2	67.4	100.0
Washington Terminal[1]		1.1		1.0	2.1	20.4							2.1	20.4	2.1	20.4	100.0
Washington Water Power Co.	29.0				29.0	29.0							29.0	29.0	29.0	29.0	100.0
Western Pacific	11.2				11.2	11.2							11.2	11.2	11.2	11.2	100.0
Total	9,314.0	9,843.0	338.2	839.7	20,334.9	33,425.4	47,067.8	8,395.0	260.8	351.2	56,074.8	66,072.2	76,409.7	99,497.6	176,844.7	201,686.3	

[1] (Chicago & North Western, Illinois Central, New York, New Haven & Hartford, Pennsylvania, Washington Terminal.) Include road with more than four tracks.

The Maintenance of Way Department

Contest on Labor Problem.

THE articles entered so far in the contest on the labor question show some very diversified conditions. In nearly all cases, however, a dearth of good laborers is noted, and it seems to be a common opinion that the general level of wages for track men will soon have to be raised. Another point which has been brought out is that steady employment should be assured the track laborers throughout the year.

Every man so far voicing his opinion advocates more considerate treatment, particularly of the section forces. This tendency has been noted for a number of years. In former years the man who made a practice of abusing his men and of making a great show of working his men hard was thought to be a good foreman. In those days it was not customary to keep close account of the costs of work. In lieu of showing results, the foreman made a great showing of being a driver.

Results are what count, and we now base our estimate (or should base it) entirely on results. When you are working a large gang of men there are liable to be a few men not working when an Official puts in his appearance. The logical conclusion for a man who has never worked a gang of men is that the gang is no good. There is a great difference in laborers; some work fast and then rest; others work steadily all day; and others, of course, do neither, and should be gotten rid of as soon as possible. No one is so capable of telling just how much each man is doing as the foreman, if he is a competent one. Higher Officials should demand results and in order to give the foreman the greatest chance to accomplish results should allow him to handle his men in his own way. And the present day foreman, as a rule, gets work out of his men through considerate treatment, and the most successful ones through a combination of diplomacy (the knack of managing men) and superior organizing ability.

There is still plenty of time for contributions to the contest on the Labor Problem. As before stated, the first prize will be $25.00 cash, and the second $15.00. Articles will be published as received, so far as possible. The contest closes July 15, at which time all contributions must be in this office. The awards will be made July 15, and checks forwarded to those taking the prizes. All other articles published will be paid for at space rates. Address contributions plainly to Editor Railway Engineering, Manhattan Bldg., Chicago.

ADZING AND BORING TIES.

Editor, Railway Engineering:

I have noted the editorial which appeared in your March issue, on "Adzing and Boring Ties."

The adzing of ties out of track is not a difficult matter, but the adzing of old ties in the track in connection with relaying rail or general regauging of track is entirely a different proposition. As far as I know, no satisfactory machine has ever been devised to do this work, such important work being left entirely to the judgment of the workman. I have found, by experience, that it is not, as a rule, a good plan to do all adzing on one end of the tie in order to bring both rail seats to full bearing as suggested in your article, as that often results in excessive cutting away of timber, making one end of the tie extremely weak. A tie is no stronger than the weakest end. Some device should be used which will make it possible to do part of the adzing on each side of the tie.

Your reference to the expense and difficulty of adzing ties under the rail is well taken. While one man is adzing the tie in connection with spiking, two men are usually standing doing nothing, but if the tie is surfaced before it is put in the track, it can be done in a workmanlike manner by one man, and the workmen using the tie have practically a sawed tie to put in.

The expense and difficulty are not the only objections to the usual way of adzing ties under the rail. It is found that old rails, whether on straight or curved track roll out under traffic, consequently, when the ties are adzed under the rail they are fitted to that condition, and unless the roll of the rail is excessive, it is often unnoticed by the workman, but if the rail seats are brought into the same plane, before the

tie is put in the track, the workman will find that neither rail will fit down on the inside if the rail is rolled out.

By using properly surfaced ties each year in renewals, much is done toward preventing rails from rolling out.

The facts are, that at no time in the history of railroads has there been such urgent need of track of the highest efficiency by reason of high speed and increased weight of rolling stock, and this condition makes it imperative on all having to do with the safety of track, to watch closely every detail that will add to the desired results.

Yours truly,

Henry Ware.

THE LABOR QUESTION AND ITS RELATION TO TRACK FORCES.*

C. Clay, Roadmaster, A. T. & S. F.

The Track Department forces consisting of roadmasters, foremen and laborers might be split up ad infinitum down to water boys and employes attached to this department owing to the exigencies of the circumstances. But for all practical purposes it might be divided under the heads as shown above. However, we can make a still further reduction as the foremen and roadmasters must be taken from a grade lower respectively, and it becomes a question of the laborer only. It would be an utter impossibility to take a man from some other position and make him a foreman or a roadmaster and expect to obtain results. Therefore the fact remains that we will have to make the best of what material we have for the present to fill such positions as become vacant from time to time and look to the budding laborer of the present day to fill such vacancies as will occur at a not distant, future period. Very good then, taking the class of men who will fill this position at the present time, what have we? But really that is too pertinent a question and involves personalities so we will leave it, taking the men under a separate head.

We have both section and extra gang laborers but to all intents and purposes these may be handled under one head. The best way to fill the demand is to draw from the local supply as far as possible. I am under the impression that climatic conditions have something to do with this. For instance taking the extremes a man used to Dakota would hike to the shade in Kansas before a local man was feazed, or a Missourian would be panting for breath in New Mexico before the native had started work. Of course, every locality has a different problem to face, but in very few places except in the desert portion of the West will a dearth of men for the section be found, at least under normal conditions. It is when the section gangs are increased and extra gangs placed at work that the labor situation becomes more acute. It is then probable that men will have to be shipped in from other places to make up the deficiency. It again depends upon locality as to what class of men you receive, but irrespective of the class you will find that they are only 30 per cent effective as to what should constitute a day's work. There is one exception and that is your American Hobo shipped from a city, after a hard winter. In the early spring he feels the necessity of having a piece of change before hitting it back to "Chi," that is Chicago. He is then more than 100 per cent effective as regards a day's work. In one case, with such a gang digging out for ballast, it became a race to see who would dig the most. This condition will not last more than a month if it lasts that long, terminating in any case with the first warm day.

In shipping men from a city it becomes disheartening to try and obtain men in this way in the warm months. The men will ship out and you have no difficulty in obtaining a car load but it is on arrival that things do not look so bright. Some have deserted on the way, others desert on arrival, others try and obtain one or two meals before leaving, but those who stay average about fifteen to the car load of eighty-four. This number again dwindles at the end of the month owing to the men not wishing to let their time go in and wait for a pay check, so that you possibly have four out of the entire shipment who work a month after arrival.

There appears to be no remedy to this as the hobo will promise faithfully to work if shipped out, but his promises do not materialize. At the first opportunity he hikes for the jungles near a fair sized town, knowing full well that a can of gump or mulligan stewed, when mooched, will appeal to him more than a meal worked for on the track. If he gets to camp and fails to get a meal without working he can rely on a hand out from the other men, and in the morning he is missing. If asked why he does not stop and work you have the old excuse that the camp is rotten, is not in the right place or he finds an old enemy in the boss. There is always some excuse. I can only quote two successful shipments, one out of Chicago from some point near the Union depot, where the men were hauled and marched to the Illinois Central where they were loaded on the car and sent out. The only desertion in this case was the man with the pass, the remainder getting to their destination all right owing to the fact that they who were not intending to work were too drunk to leave the car which resembled a shambles when they did so. These men went to work the next day, but I firmly believe that they did so only to work off the effects of their debauch as they did not last long, but in comparison with most other shipments this one was a success.

The other shipment was out of Winnipeg, Canada, over the Canadian Northern. In this instance the car doors were locked (why I do not know), but if it was to keep the men there it might be termed a failure as the damage to the windows, etc., would be an item of expense that would not repay for the mere result of getting all the men to their destination. The windows were wantonly broken when the men found they were locked in, but they all arrived at their destination. Only one man attempted to leave the train via the window and after the train crew argued with him and the result was noted, neither he or the rest of the men felt the least inclination not to go to their destination. This may have been because he attempted to leave on the soil of the United States when the shipment was being made from one Canadian point to another, at least that is the only reason I can advance for his being returned to the car.

I believe that the Rock Island and other roads shipping hombres out of El Paso obtain better results but this is owing to the fact that Mexicans do not understand the language to any extent and consequently can be herded to better advantage. This is also true of the gangs of Southern European laborers shipped out of cities. But taken as a whole the laborer speaking a foreign tongue is unsatisfactory in whatever capacity he be placed. Your English speaking laborer is the only man who can fill the place providing he can be induced to do so. The majority of men have told me that they ship out while partially under the influence of liquor, others when they felt homesick and others in a spirit of vainglorious bravado. But if you can spare the time to obtain it, travel, dress and work as a hobo for a while and you will receive the most liberal education in your fellow men it is possible to obtain. But that is beside the question. The answer to the problem may be summed up as follows: obtain local labor where

*Entered in the Contest on the Labor Problem.

possible but do not use shipments except as an actual last resource.

There are no special inducements that can be given to a laborer to get him to stay on the job under present conditions. Where there are no houses it is possible to use old box car bodies to good advantage in housing laborers or to build small and cheap houses to take care of them. The one question that seems to be paramount in this matter is the obtaining of supplies. Their wages are small, they are not of a saving disposition and even if they were the savings would be small with the present cost of living. A board bill is the only way of solving this question, as the usual run of storekeepers will not give them credit, except on the word of the foreman, and as a rule the foreman is merely taking chances where he goes good for the men on his gang, unless he is able to protect himself. Therefore, the only inducement you can offer is to see that the laborer is housed and fed according to the limit to which you are restricted. The laborer rarely asks for passes, as his income does not permit of his traveling to any great extent, so that this need not enter into the question. Different questions will come up in the different localities but it will pay to study the matter of keeping your laborers satisfied and see that the foremen understand that this must be done. Gone is the day of the overbearing authority in the foreman, for the simple reason that men will not work for such a man and it is to the interest of the company to employ a man that will study his men rather than one who says "I am foreman and as such my orders must be obeyed implicitly." True he must be master, but there is a greater effect to be obtained in coaxing than driving.

Where you have a driver you have a set of men who are dissatisfied and ever looking for a place to move to. There is one way this can be watched other than on the work; just look over the number of time checks you issue and you can soon locate your drivers. Then again where you have a driver, you will find that the number of personal injuries increase. Trifling things possibly, but all counting up in the grand sum paid out by railroad companies under this item. Men have a limit of endurance and this also is governed by climatic conditions. Watch the weather and treat your men accordingly. Place yourself in the laborer's position and judge what would be your condition, then treat your men in the way you would wish to be treated. Now do not take this radically. I do not mean that if you feel as if a shade tree would be welcome, take your men there. The work must done and when men are tired they will not work so readily; therefore do not push them. Put it up to them that there is so much to be done and it is in the interest of all. If you see one man doing a thing in a harder way than necessary show him how to do it so that he will not tire so readily. If a man does not appear to be doing all he work he should do, there is a reason; try to see what this is, he may be sick. In any case do not bawl him out before the gang; call him to one side, and ask him about it. If he treats it in a spirit of levity and says something about being tired, give him his time; he is merely wasting time for you. If he is sick or has been sitting up part of the night with a sick wife or child or on account of any other good reason, treat him considerately. You may be sure that this will not be lost on him and if he is the average man, when you want him to hustle, he will surprise you. The company will lose nothing on his being a little slack that day as he will more than repay it afterwards. Naturally you will find men who are not appreciative. I am speaking of the average man; with the others you need not trifle but replace them as soon as possible. Even if you do have to break in a new man who will appreciate anything done for him, you and the comapny will be the gainer in the end.

There is one little axiom that is the crux of the whole matter, "You cannot get something for nothing." If possible the wages of the laborers should be raised but under present traffic conditions this appears to be a thing that cannot be done. We have laws that increase the cost of operation and decrease the revenue and everything in the matter of law seems to be so unstable that a large increase cannot be looked for. I will not attempt to criticise laws of this nature as it would not serve the purpose of this article. I am merely advancing this as one reason why a large increase, which the increase of wages in the Track Department would involve, cannot be looked for at the present time. Possibly at some future date some of the harrassing laws will be repealed and then we will be able to treat the matter under the light of increased wages but as at the present time it merely remains for the man to obtain the best possible material locally, go to your limit in making men comfortable and seeing that they are able to obtain the necessities of life, treat them considerately in their work and give them to understand that they will be promoted according to merit.

Without the co-operation of the foremen in seeing that the laborers are treated considerately nothing can be done. Therefore it will be necessary to see that your foremen work for you. This will mean a percentage of efficiency on a division that will surprise the man who makes the matter a study with a view to increasing the efficiency of his track forces. When you have your division operated on this basis (and you will only do it after studying local conditions) you will have laborers who will work for the foremen and foremen who will work along these lines and see that laborers are not abused.

ADVANCING MONEY TO LABORERS.*

S. Cheatham, Roadmaster.

Our laborers on section gangs are all natives. North of the Ohio River we work white men, and south of the Ohio River we work colored labor, and use colored labor on all of our extra gangs. However, we do not get what would be termed a good class of labor, as the trouble on all railroads is that they are not paying section or extra gang laborers enough to secure good labor.

We try to encourage our laborers as much as possible by furnishing them with section houses to live in and giving them passes to go over the road whenever it is requested for themselves or their families. We also allow our section foremen and extra gang foremen to advance the men money from pay day to pay day, giving them the privilege of a stoppage of 50 per cent, which is some encouragement and helps to hold colored labor especially.

On our extra gangs we furnish good comfortable boarding cars for our laborers and also allow our foremen to carry a commissary to furnish the men with necessaries and advance them a little money along through the month.

We find that the foremen can get more work out of the men by treating them considerately than by harsh methods.

In spite of all this, we do not get a good class of labor, and in my opinion it is only a question of a few years until railroad companies are going to be compelled to pay their section laborers more money.

Bids are wanted by MacKenzie-Mann & Co., Limited, Metropolitan building, Vancouver, up to noon of July 8, for the sub-structures and super-structures of 10 bridges, to be built over the Fraser, the Thompson and the North Thompson rivers, on the Canadian Northern Pacific, between Port Mann, B. C., and Yellowhead Pass.

*Entered in the Contest on the Labor Problem.

OBTAINING GOOD LABOR.*

Thomas Brannan, Rdm., D. M. & N. Ry.

Foremen should select their own men and have full control of their section laborers. They should, of course, be allowed to hire or discharge men as they see fit. The first requirement is to have a good sober man for section foreman, one who understands his work thoroughly from A to Z and who can handle men. Then pay fair wages for section laborers the year round and see that section foremen keep the houses for laborers neat and clean, treat their men considerately, and do not drive or scold the men. If there is a man or two who shirks work, the foreman should pay them off and get other men in their places. The section foremen should be furnished with a house, free of rent, kept in good repair all the time. We go even further than this and also supply all the ice he needs for the summer and allow him a piece of land for a garden. By good treatment I find we have no trouble in getting all the laborers we want and the best kind. We have as foremen—Germans, Norwegians, Swedes and Irish.

For extra gangs we furnish boarding cars, especially built for the purpose—well ventilated—with good sleeping quarters and do not allow the cars to be crowded. Cars are kept clean all the time and in good condition. Plenty of good, clean bedding is furnished and the best of board. It pays to treat men well, for then you will get good results from your men. We take our foremen from the ranks. When we have gangs of 40 or 50 men I always select a good man with a fair education and make him assistant foreman and educate him to do track work, and then when I am in need of a foreman I know where to get one. Treat men fair all the time and you get the best results. I consider that 10 good men can accomplish more work and do better work than 15 poor men can do. With fair treatment and fair wages you can get a good class of labor and that is what is needed on railroads. If a gang of men is dissatisfied you get very poor results from them. Often dissatisfaction arises from the board or sleeping quarters. In that case the foreman in charge should get after these matters and see that the men are better cared for. When the men see that their wants are looked after they are satisfied and willing to do a good day's work without driving them. We must have intelligent men on track work and it is the duty of every man in charge to treat the men fair and see that they are educated in their work, as I consider track work very important and it takes skilled men to do the work in a workmanlike manner. A great many do not follow track work, simply because they think there is nothing in the future for them. If they get fair wages and good treatment they would stick to track work and become useful men.

DEFINITE SYSTEM FOR HANDLING LABOR.*

J. J. Bethune, Roadmaster.

On this road we have a definite system of engaging men for track work. Our men work under a schedule and are all on the superannuation fund. There is an age limit. No new man is employed over 35 years of age, and then he has to pass a medical examination and work six months on probation before becoming a permanent employee eligible for the pension. All my men are Brotherhood men, and are promoted according to seniority if otherwise qualified, the roadmaster being the judge of the applicant's efficiency for promotion. The fact that our new men serve six months on probation enables us to get good men. One of the necessary qualifications is that an applicant must read and write English fluently and legibly.

This restriction gives us a good class of men. When the roadmaster rides on the rear of train and he notices something that should be attended to immediately, one of the men who walks the section may be the first he passes, and if this man is illiterate it will do no good to drop him off a note to have it attended to.

When we require extra gangs we have to pick them up wherever we can get them, as laboring men are scarce here. We generally try to arrange our extra work at certain seasons when men can be procured. We do not have to employ foreigners, hence a good foreman can take a gang of men and break them in, in two days.

There is only one way of keeping men satisfied and get a good day's work out of them. Never forget they are free-born men, not slaves, and pay them the maximum wage for their labor. If the foreman is a brute dismiss him. There is only one man out of twenty that is fit for a foreman of an extra gang. Give me the foreman who has the good will of his men in order to get a good day's work done.

From 25 years' experience in track and bridge work I long ago concluded that a section foreman or a foreman of extra gangs requires more brains than any other employee in the service. Therefore, he must have a good education. He must know intelligently how to find the degree of any curve in order to give it the proper superelevation for certain speeds of trains, etc. There should be no guess work about track maintenance. The roadmaster must be intimate with all his men. In this case, familiarity does not breed contempt, if you know how to use it. A roadmaster should never criticise or call down his foreman in the presence of his men if he expects to keep proper discipline in the service.

As soon as railway companies realize that the success of the traffic and the lives of the traveling public depend largely on the section gangs, they will give better inducements in remuneration and recognition to these faithful men, which would be the means of obtaining and retaining the best men in the service and of getting the best returns from labor. My experience has shown that track men who are union men are the best men, as the rules and regulations of their order very often assist the management to settle small grievances that otherwise would be a continual trouble.

As to the routine of work in track maintenance, this depends largely on conditions and climate, but there should always be a system to correspond to the varying requirements.

HUMANE TREATMENT FOR LABORERS.*

Foreman, C. & E. I.

Everything must either progress or retrogress, and so we find a change in the class of men used as track labor. Years ago it was possible to get practical track men, either Americans or men from the northern European countries. Today we have track men from the southern parts of Europe. They are less skilled; there is a big demand for track men in the summer, but in the winter the forces are cut down. Thus competent men are driven to the factories, where they have year around employment and higher wages.

All extra men to be used during the summer, should be hired before the middle of March in order to get the pick of the available labor supply.

The only way to attract first class men to the railway field, is to pay good wages, and keep the men working the year around. Married men are the best and steadiest track men, and they must have steady work. Men like to work in gangs, and will always be better satisfied if working with six or seven other men, than if working

*Entered in the Contest on the Labor Problem.

practically alone. This is an additional reason for not cutting section forces too low.

In order to hold good competent trackmen, a foreman must have common sense and experience, and treat his men with kindness. A foreman may lead men, but he cannot drive them successfully. Incompetent foremen are extremely expensive, and cannot maintain tracks in decent shape.

The treatment you accord your labor determines in great measure the amount and quality of work you accomplish. It is not right for human beings to live and sleep in filthy and ill-kept bunk cars, and furnish them work for only part of the year.

OBTAINING AND HOLDING TRACK LABOR.

By E. B., Roadmaster.

All our track labor for section gangs is foreign labor, usually Mexicans, and we offer them a return pass to Mexico providing they stay the required length of time. The labor is furnished for extra gangs in the same way as for section gangs. About 20 per cent of the men make good track men and 80 per cent are very poor. We try all methods to increase the amount of work accomplished, as 80 per cent of the men which we receive are incompetent and we cannot expect the amount of work from them which we should if the men were competent track men.

The foreign labor as a rule has got to be driven to require the amount of work which should be done.

Track men should be paid more wages. This would give a more intelligent class of men in track labor. And by getting more intelligent men for track labor, that is, men that would take an interest in the track work, we would accomplish more work and a great deal better work, which would decrease maintenance expenses at least 25 per cent.

RELAYING TRACK AND RENEWING TIES.

In relaying track I think it best to set up one rail at a time. The coupling alongside and throwing in with bars is not a bad practice on tangent track if care is exercised in keeping the rail running ahead so as to maintain full joint expansion. If carelessly done the rail will buckle back, causing tight track.

Single, or double tie renewals as a rule I consider the most economical and best method of renewing ties. By double tie renewals I mean where two can be removed alongside each other and two new ones laid. In this way the track always has sufficient good ties to keep it entirely safe and in good surface and alignment, and every tie can be left in service one to two years longer than where the laying in continuous stretch methods is in practice. I do not consider the continuous stretch practice justifiable except in instances where practically all the ties are gone, then the proper method is to put them in out of face making a complete job of it, relaying, surfacing, lining and reballasting.

Foreman, Northern Pacific Ry.

Editor Railway Engineering: I am in favor of relaying track by placing one rail at a time in the track. You can make a better job of it. Adz off the uneven ties in good shape and drive down all stubs. Lay the rail level and you get the proper expansion in the track.

When you string the rails out along the side, couple them up and then slide them in place, you either tighten or loosen the expansion and get more or less gravel or other dirt under the rail which does not give it a level bearing.

I would prefer renewing ties to face. By doing this you are not digging up your track each year and your track is solid and easy to keep in good shape for a long time.

Roadmaster.

Editor Engineering: I favor placing one rail in at a time, then bolting, spiking and gaging.

I never string rail along the track and bolt them up, then slide them in place. With this method it is very difficult to get your expansion right at the end you head in; it always creeps one way or the other. I have tried both ways many times.

I prefer to renew ties one at a time, and not out of face, for the reason that if track is properly maintained, ties will not need renewing out of face. The railway I work for usually renews 10 per cent each year which gives good results in keeping good surface and gage.

Supv. C. & E. I.

Editor Railway Engineering: I practice the rule in relaying rail to place one rail in the track at a time. My reason for preferring to lay rail this way instead of coupling the rails up and sliding them in place is that you get a much better job. In the first place, you get a more even expansion in the joints. In the second place you get a better adzing on the timber. You get your rail set up straight and square by placing one rail at a time and I find that it is the life of a rail to have it set properly when it is first laid.

In regard to renewing ties, of course this depends on conditions. Lots of times a man has to renew ties out of face, as perhaps it had been done in previous years, causing all the ties to give away at the same time, but I do not prefer renewing ties in this manner. I try to renew a certain number of ties each year, and try to keep my track timbered up so that it will take anywhere from five to eight ties to a rail a year for repairs. You can maintain your track and put in from five to eight ties to the rail each year and by doing this, you do not disturb the greater number of the ties, leaving them on the old roadbed. This prevents your track from getting rough when you have wet weather.

Roadmaster, Mobile & Ohio.

Editor Railway Engineering: I favor placing one rail at a time in doing relaying, for the reason that more uniform expansion can be maintained and that track can be connected more quickly, thus avoiding delay to trains, etc. Better progress can also be made and work done in a more satisfactory manner, as men are not scattered over so long territory as when rail is laid by stringing and coupling together before placing in position.

I prefer "out of face" renewals if for the purpose of making progress and record as to number put in; but think it unwise to permit conditions to become such as to require "out of face" or general renewals. In order to keep and maintain good safe track, there should never be anything more than "single tie" renewals required, as by so doing you do not disturb the surface or line, thus saving a very great expense and liability of accident; where as by a general renewal being required it necessitates a general overhauling of track, resurfacing, lining, etc., besides the liabilities as above mentioned.

Roadmaster, Great Northern Ry.

Editor Railway Engineering: Under ordinary traffic I do not favor placing one rail at a time as it is altogether too slow. I have no doubt but what the spacing can be made more uniform by laying rails in that way but time will not permit and we string rails out, bolt up 10 or 12

lengths, and slide them in. This allows us to keep our men working all the time between trains, whereas, the other way, the men would be idle.

I prefer single tie renewals as it is very seldom a stretch of ties will all show the same degree of decay. Ties may be laid in a new track, at the same time, and after five years some of these ties will be rotten while many of them may last 10 or 12 years. If ties are renewed to face, many ties are taken out which would do good service where they are, and, of course, they can be picked up and used on some side track but the expense of doing this, is, in most cases, prohibitive.

Division Engineer, Boston & Maine.

Editor Railway Engineering: I relay rails by placing one rail in at a time, for by so doing, better and more uniform expansion is maintained than can be where the rail is set up in a string alongside of track, coupled up, and then slid into position.

It is essential that the proper expansion be maintained at each joint. In placing one rail in at a time, I use steel expansion shims made in an "L" shape, so that the top of the shim laps over the head of the rail that is in position. The expansion shims are allowed to remain in the joints for at least 20 rail lengths back of the rail that is being set up, and allowed to remain in each joint until splice is applied and bolted. One man then goes along with a light bar, pries up the joint and removes the expansion shims, placing them in a box, which he carries. The shims are removed before the rail is spiked; a thermometer is carried and carefully observed, by which the thickness of the expansion to be used is determined.

If the rail is laid up in a string and coupled up, the temperature, it is reasonable to assume, will change from the time of commencing to put the rail together, and the time it is slid into the track. The length of time, however, depends largely on the number of men employed, and also on the length of the string to be coupled up. In laying curves, the outside rail, when throwing in, will be inclined to close up at the joints and become tight, while the inside rail will have a tendency to pull apart.

I favor single tie renewals, unless in a tunnel or other such difficult locations, where I would renew ties to face. By making single tie renewals, only such ties are taken out as are decayed, or broken, and if ties are taken out to face, many of the ties so taken out will be found good enough to be again put in track where they may give service from one to three years; it will cost 10c a tie to put them in, and many of the ties, if taken out to face, will be found scarcely worth putting back in any track, while if they were left in track, may give service for one or more years longer.

Roadmaster, Michigan Central.

Editor Railway Engineering:

When relaying rail I am of the opinion that laying a single rail, that is, one at a time, is the most economical and best way, as in this way proper expansion can be maintained. Angle bars can be placed on new rails before they are put in track by putting one bolt in the joint loosely. Then the joint is ready for a man to tighten quickly. Single rail workmen are always ready to clear track quickly for trains, and more uniform work can be done in this way. Long stretches of track are not disturbed, causing long delays to trains. When new rail is put in in strings there is much delay to trains at times, as foremen will be hurrying to get all in that he can and hates to cut the string of rail.

In single rail laying with a good organized gang of men, each man keeps moving along at a certain kind of work he is to do, and does not have to change from one kind to another. Where time is lost in laying new rail is jumping from one job to another. Only when traffic is very thick and heavy should rails be laid in strings, as I believe it is the most expensive and cannot be laid as perfect as single rail laying.

I believe single tie renewals are the best, as renewing ties to face is more expensive. I find we obtain the best results in repair work by surfacing out of face, giving a nice light surface, where the tie renewals are heaviest, say on about one-third of the section. This way a foreman will have his track surfaced every three years. By surfacing the worst miles where the renewals are heaviest and spotting in and smoothing up the balance of the section, I believe the track can be kept in good condition. When ties are renewed the solid roadbed is disturbed under the new ties and it is almost impossible to get them solid and even bearing with the rest of the ties in the track. Therefore, it is necessary to surface out of face with heavy renewals.

Roadmaster.

MACHINING TIES.

Editor Railway Engineering:

My opinion in regard to adzing and boring ties for use with drive spikes, and prior to shipping them to the points where they are to be used is as follows:

Where ties are not to be treated, I do not believe the adzing and boring before shipment would be worth its cost. If the Railroad had all one weight and section of rail and uniform gauge, it might possibly be a paying proposition, but I do not believe any of the railroad companies are so fixed.

In the case of treated ties, the adzing and boring before treatment would undoubtedly have considerable advantage, and if a railway system had only one or two sections of rail in use and the gauge were uniform, I think it would be a paying proposition. However, I believe the majority of railroads have so many different sections of rail in use that it would cause considerable additional expense to classify ties of different borings, keep them separate, and have the proper ties reach their destination in all cases. In such case, I think it questionable whether the adzing and boring before treatment would be a paying proposition or not. Such a practice would, in many cases, necessitate regauging at the time ties were being put in.

M. C. Byers, Chief Engineer-Operation.
St. L. & S. F. R. R.

Editor Railway Engineering:

I beg to say that I can see no advantage for machining and boring ties for drive spikes. The only possible justification is where ties are to be treated and this work can be done prior to treatment, and even in these cases I think the benefits to be derived do not compensate for the extra trouble in handling. The only boring of ties that I think is justified is where screw spikes are used.

W. L. Seddon, Chief Engineer,
Seabord Air Line.

Editor Railway Engineering:

In connection with the use of screw spike we drill ties at the tie treating plant before treatment, using a template to locate the holes in the proper places, but do not do so in the case of drive spike, and do not consider it necessary. When new holes are driven we have plugs for filling the old holes, and these plugs are burnettized.

R. L. Huntley, Ass't Gen'l Manager,
Union Pacific.

Editor Railway Engineering:

On account of the various weights of rail on different parts of this railway system which have different widths at the base, it is impracticable to have the ties bored for spike holes before treatment unless it is known for some time in advance just where the particular ties are to be applied and even this is not entirely practicable, as the light rail with narrow base might be changed out for heavier rail with wider base before the ties were worn out, and in that manner what advantage might have been expected from having bored the spike holes before treatment would be lost.

I do not feel that it would be advantageous to have the treated ties simply adzed by machinery before treatment, nor do I feel that the advantages of lesser destruction of wood fibre, increased holding power of spikes, or easier driving of the spikes, would warrant the adzing and boring of untreated ties by machinery, and the same disadvantages of width of rail base holds true in the case of untreated ties.

E. F. Mitchell, Chief Engineer,
Missouri Pacific.

Editor Railway Engineering:

I would respectfully advise that in my opinion where treated ties are to be used, considerable economy would accrue from the boring of ties for driving spikes before treatment. I do not think there would be very much difficulty in securing in advance the necessary information as to where the ties are to be placed, thus determining size of rail, existence of tie plates, etc.

I do not consider the economy of boring of untreated ties for drive spikes of sufficient magnitude to justify the expense attendant therewith. The ease with which a square spike is driven into a bored hole and minimum disturbance of wood fibers are not, in my opinion, entirely sufficient reasons for the pursuance of such a plan with untreated ties.

J. G. Gwyn, Chief Engineer,
Denver & Rio Grande.

Editor Railway Engineering:

It has only been in the past two years that this road has gone into the extensive use of treated ties, and we do not have them adzed or bored before treatment when they are to be used with ordinary cut spikes, but we do consider it advisable to have this done where screw spikes are to be used. When ties are not to be treated, they are neither adzed nor bored.

It is my opinion that the advantage of lesser destruction of wood fibre and increased holding power resulting from boring ties would not overcome the disadvantage with untreated ties.

Earl Stimson, Chief Engr. M. of W.,
Baltimore & Ohio.

Editor Railway Engineering:

Relative to the question of adzing and boring ties for driven spikes, I think the advantage of the lesser destruction of wood fiber, increased holding power, better and easier driving of spikes, etc., in overcoming the disadvantages of preparation for untreated ties, depends a great deal upon local conditions. The conditions on the Northern Pacific are not such that the adzing and boring of ties can be done in the yard, principally on account of the many points of receipt of ties, and the fact that they cannot be assembled at a few places to be adzed and bored.

W. L. Darling, Chief Engineer,
Northern Pacific.

Editor Railway Engineering:

While it is well known that spikes driven in bored holes do less damage to the wood fibre than spikes driven without holes being bored, the experiments made by Mr. R. I. Webber at the University of Illinois in 1906 indicated that the spike driven into a bored hole has more resistance against direct pull than one driven without a hole being driven.

With untreated ties, which, as a rule, decay in ten years or less, it may not be economical to go to the additional expense of boring holes for the spikes.

With treated ties, where the treatment materially prolongs the life of the ties, it seems advisable that holes be bored for the drive spikes.

In regard to adzing; that is, planing off part of the tie for the rail seat, by machine, such practice seems desirable with reference to treated ties, as well as untreated ties. All such adzing and boring of treated ties should be done before treatment.

In regard to the planing or adzing of ties, this planing can be done without any definite information in regard to the size of rail to be used on the ties. The boring, however, will have to be done with reference to the size of the rail to be used.

Robert Trimble, Chief Engineer, M. of W.,
Pennsylvania Lines West.

Editor Railway Engineering:

I consider it necessary, if ties are to be treated, to do the necessary boring, adzing, etc., before the ties are treated. If the ties are not to be treated and screw spikes are to be used, it would be advantageous to do the boring before the ties are placed in the track. Where ordinary spikes are used, no boring of any kind is necessary previous to placing the ties in the track.

A. O. Cunningham, Chief Engineer,
Wabash R. R.

Editor Railway Engineering:

We are contemplating the plan of having our creosoted ties bored, with the idea that it will be necessary if we should go to screw spikes. The great advantage is that the tie underneath the rail will receive better treatment on account of the holes being bored before the tie is treated, which will permit of the creosote reaching all parts of the tie under the rail.

J. G. Sullivan, Chief Engineer,
Canadian Pacific.

The Elberton & Eastern will build from Tignall, Ga., in Wilkes county ,to Lincolnton. The company was organized last year with $500,000 capital, to build about 50 miles from Elberton to Lincolnton. W. O. Jones, president, Elberton, Ga.

It is reported that the El Paso & Southwestern is to start work in July on a branch from Lewis Springs, Ariz., to Fort Huachuca, about 15 miles.

Culliton Bros., Spokane, Wash., have been awarded the contract for the grading and bridge work for the first 10 miles of the new extension of the Esquimalt & Nanaimo.

The Gauley & Summersville, Swiss, W. Va., has been chartered with a capital stock of $10,000 and proposes to build a line from the mouth of Peters Creek on the Gauley River to Summersville, for the development of timber and mineral rights in that section. Peter Carroll, Charleston, W. Va., is one of the promoters.

The Oregon-Washington line of the Harriman system is to build a 25-mile extension, costing $600,000, from Moscow, Idaho, to Genesee.

With The Manufacturers

LARGE CAPACITY STONE DERRICK.

The illustration herewith is of one of the largest derricks now in use in New York for the purpose of loading heavy stones. The capacity is forty tons, and the length of the boom is sixty feet. The construction throughout is especially stiff and strong, without extra weight. A derrick to be installed on a barge should, of course, be as light as possible, this feature being more necessary here than for ordinary uses where the derrick is to be operated on the ground.

The derrick shown herewith was built by the Hind Hoisting Machinery Co., of Buffalo, N. Y., which is one of the largest concerns in that city manufacturing hoisting machinery for contractors, railways, etc.

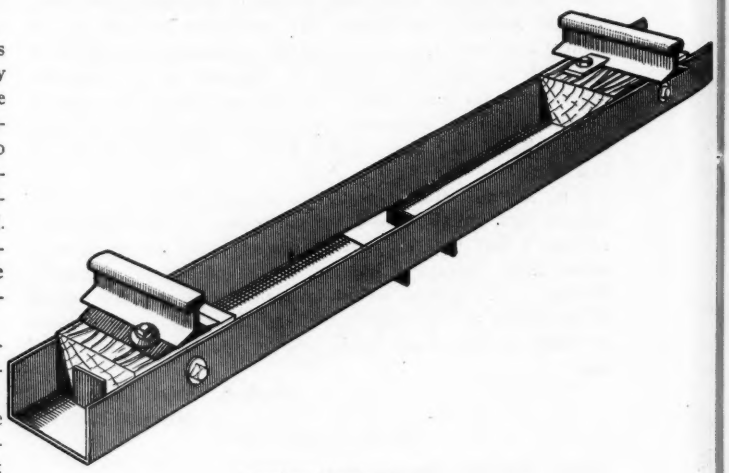
Mr. Wm. M. Hind, president of the company, was employed for a number of years as superintendent for the Contractors' Plant Co. of Buffalo.

The Hind Hoisting Machinery Co. recently purchased the plant formerly occupied by the Riverview Bronze & Manufacturing Co. This addition to the plant gives excellent facilities for the manufacture of standard and specially designed hoisting machinery and contractors' equipment.

STEEL TIES WITH WOOD RAIL SUPPORT.

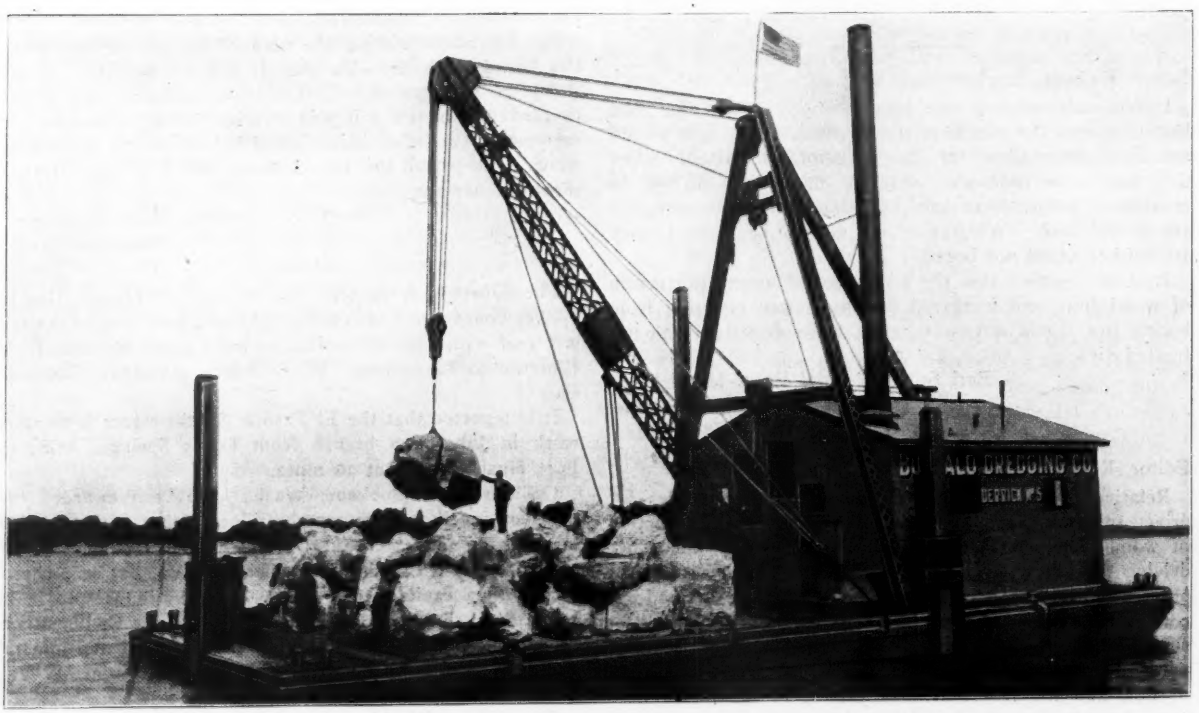
The steel tie illustrated herewith is composed of a channel of sheet metal and two wooden blocks. The sides of the channel are low and the wooden blocks (which are about the same width and thickness as an ordinary tie) stand up well above the metal sides. This feature does away entirely with the need for insulation in automatic signal territory, and gives the same resiliency as a wooden tie.

A small piece of the metal is turned up at each end of the tie from the bottom section of the trough, and these lugs retain the wooden blocks and prevent them from spreading. The hole left by turning up these lugs is directly beneath the wooden block and the strength of the channel is not materially reduced. However, the block takes practically all the stress at this point anyway, and a slight reduction in the section does not affect the strength of the tie. The block is rigidly held to the channel by a single bolt.



Standard Steel Tie.

Any size rail can be laid on these ties, or any change in rails can be made with no more trouble than on ordinary wooden ties. The spikes are easily drawn and redriven to



Large Stone Derrick Built by Hind Hoisting Machinery Co.

fit the new rail. Any kind of a tie plate can be used, and any kind of a spike. The tie, in fact, can be used anywhere a wooden one can.

When the block wears out, it is easily removed by digging out the ballast from the channel, raising the rail slightly into a bar, and driving the block in towards the center of the tie. The bolt must, of course, be removed first.

In the center of the channel two pieces of metal are turned down, leaving plenty of space for the moisture to escape from the channel. This open space may be made large or small as desired. By making this open space about 18 inches wide, the bearing of the tie will be only under the rails and about 18 inches on each side. This construction would eliminate center bound tracks.

The wooden blocks can be treated by any process, and the preservative would probably be held long, as the block is wholly protected by the metal, on two sides.

The cost of renewing wooden blocks, it is claimed, will be nearly, if not fully balanced by the value of the tie as scrap, when worn out.

This tie is very light weight, no heavier in fact than many wooden ties. The metal is so distributed that the maximum strength is obtained just beyond the end of the rail blocks. It is claimed that the life of the channel section will be about three or four times that of the average wooden tie.

The metal tie described herein is being marketed by the Standard Steel Tie Co., of Dallas, Tex., with a branch office in Chicago.

ORANGE PEEL BUCKET WITH CAST STEEL ARMS INTEGRAL WITH BLADES.

The accompanying illustration shows an excavator bucket of the orange peel type, which is notable in having the blades and hinge arms integral, or cast in one piece. This construction does away with all rivets where projecting heads are subject to wear. The blades are made of cast steel, which gives great resistance against wear. Another feature is the design of the crown rigging so that three sizes of blades can be attached, giving with one crown rigging, for example, a ¾ cu. yd., a 1 cu. yd., and a 1¼ cu. yd. bucket. The crown rigging, like the blades, is made of cast steel. A feature that will be noticed is the design of the lever arms with a forked head, giving double bearings and a wide hinge at the top to reduce wear and pressure alignment in opening and closing the blades. The forked lever arms hinge to a curved steel center block which is designed so as not to bind, thus permitting the bucket to hang centrally in every position. All bearings are bushed with steel tubing which is easy to keep in stock and easily cut to make new bushings as they are needed. The makers claim that a set of bushings can be changed in an hour or two. They also point to the rugged construction as giving great strength and durability. The Industrial Supply & Equipment Co., Philadelphia, Pa., manufactures the bucket herein described.

Work for a reputation and it will work for you.

Be the man you want the world to think you are.

It doesn't take long to write the biography of the man who never offended anybody.

Lots of men and things seem easy until you try to do them.

The greatest hindrance of all is to meet no opposition.

—Ideal Power.

Orange Peel Bucket with Cast Steel Arms.

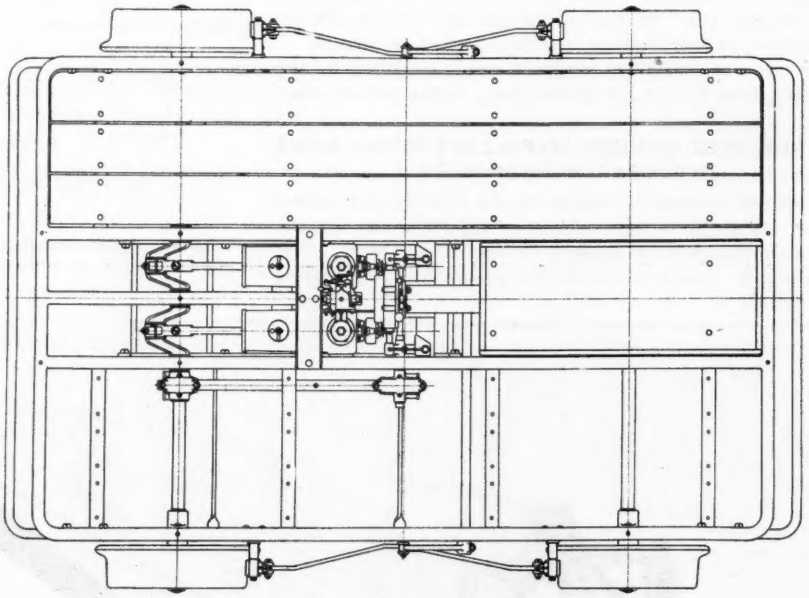
ROCKFORD CARS.

Frames.

One of the recent improvements in Rockford cars is the use of a steel frame instead of a wooden one. After using this construction for eighteen months, it is said to have been found satisfactory for service in every respect.

Wooden frames were used originally, and, while they were very satisfactory and gave good service, it was found that long service tended to loosen the frames and get the working parts of the car out of alignment. With the idea of remedying this the manufacturers of this car decided to build frames of steel channel. The first steel frames were riveted. They were found to be much stronger and more satisfactory than the wooden frames, but were not yet perfect because it was found to be practically impossible to so rivet the frames as to prevent them from gradually loosening and being open, in some measure at least, to the same criticism which applied to the wooden frames. Oxy-acetylene welding was then applied in building the frames, and it was soon demonstrated that this would overcome all former difficulties, and the welded channel frame was adopted as standard.

Specially Designed Connection Rod.



Welded Steel Frame Used in the Rockford Car.

The welded steel channel frame is practically indestructible under any ordinary service conditions. It combines strength and rigidity with lightness and durability. Being one solid piece it cannot possibly shake loose in service and will hold the working parts in perfect alignment for the full lifetime of the car. Its use makes it possible for the car to be built with lower and more easily accessible platforms and longer wheel base than formerly. The frame takes up less space and materially lessens the number of pieces used for the platform, also.

Rockford cars are now all built with welded steel frames. For the No. 4 and No. 5 cars three inch channel is used, while two inch channel has been found amply strong for the No. 2 or inspection car.

Connecting Rod.

The connecting rod of the Rockford car has a pocket formed near the crank end, leaving a chamber which is filled with lubricating oil when the car is in use. The bushings on the crank end of the rod are die cast babbitt and a slot is left in one bushing. Two holes are drilled through from the chamber containing the oil into the slot in the babbitt bushing and a felt wick is inserted to carry the oil from the chamber to the bearing surfaces on the bushing. This provides a positive lubrication for this bearing. All the operator of the car has to do is to see that there is oil in the chamber, which has a knurled and slotted plug easily removable for filling and easily accessible to the operator.

The chamber in the rod is large enough to hold an amount of oil sufficient to amply lubricate the bearing for three hundred miles of travel. On test Rockford cars equipped with this type of connecting rod have run as much as three hundred and thirty miles on one filling of the oil chambers.

This manner of oiling does away with the necessity of using oil cups on the connecting rods and provides a more simple and reliable lubrication for the bearing. The chamber in the connecting rod holds two or three times as much oil as the average connecting rod oil cup and consequently requires filling less frequently. It cannot waste the oil, every drop put into it is fed to the bearing, and there is no possibility of breakage in ordinary service. It feeds the oil continually from the inside outward to the bearing and this tends at all times to wash out any dirt, grit or such matter which might work into the bearing from the outside. The oil pocket has a drain plug on the lower side which is easily removed at any time and which enables the user of the car to flush out the pocket and drain off any dirt which might have been in the oil. No grit, dirt or any sort of foreign matter can reach the bearing surface from the oil pocket because it cannot pass through the oil wick.

The pocket oil cup in the connecting rod reduces the cost of maintenance of the car by reducing the consumption of oil and practically eliminating the necessity of replacements and consequent annoyances due to the fact that these small cups are very easily broken.

The recent improvements in the Rockford car, together with the fact that sales are arranged on easy terms, makes it of direct interest to purchasers. The cars are manufactured by the Chicago Pneumatic Tool Co., Fisher Bldg., Chicago.

TRACK SUPPLY ASSOCIATION.

The Track Supply Association will hold an exhibit September 9 to 16, in connection with the 30th annual convention of the Roadmasters and Maintenance of Way Association. The convention is to be held in Hotel Statler, Buffalo, N. Y.

The Association is anxious to obtain at once the names of all those desiring to exhibit. Further particulars may be had by addressing F. G. Preston, Sec. and Treas., P. & M. Co., Chicago.

New Literature

The Metal Shelter Co., St. Paul, Minn., issues a high-class catalogue describing the Pruden line of fireproof portable steel buildings. The catalogue contains the strong guarantee which is given with each manufactured article. The booklet is well illustrated and edited, the printing being in a distinctive brown color. Complete price lists and list of equipment is given for each building.

* * *

The General Railway Signal Co. has issued a strong binding or catalogue cover, into which its different loose leaf catalogue sections can be filed. The cover is heavy and durable and insures that the catalogue material will be kept in good condition. Catalogue section J, part 2, has been issued describing the model 4-A electric switch machine. This machine lies parallel with the track and is made especially to use in places where there is little room between tracks.

* * *

The Hurley Track Laying Machine Co., Fisher Bldg., Chicago, has issued a very attractive new catalogue. The color of the paper is a rich sepia, and the whole effect is very distinctive. A complete description is given of the machine, illustrated with numerous illustrations and explanatory diagrams. The first portion describes very plainly the operation of the machine, showing that it requires a very small force of laborers. The next section describes the motive power, which is furnished by the engine on the pioneer car, no locomotive being required while laying track. The distribution of material is described, same being automatic, and requiring practically no manual labor. A list is given showing the proper organization of the men about the machine. Attention is called to the speed which may be attained. The machine moves constantly at the speed required to keep the material coming just as fast as the gang can move ahead. A number of letters of endorsement from users of the Hurley machine are printed in the back of the booklet.

* * *

The Boss Nut Co., of Chicago and New York, has issued a small pamphlet describing the Boss lock nut. The construction and principles on which the nut locks are described in detail, with illustrations. List prices for different sizes are shown at the back of the book.

* * *

The Forbes Co., of Philadelphia, has issued a handsome catalogue descriptive of the Forbes Water Sterilizer, which has been installed in a number of railway stations. The principle of operation is described, being in short as follows: Water is brought to a boil in coils with mechanism so constructed that boiled water will overflow and be replaced by raw water. The raw water enters through a pipe which encloses the hot water overflow pipe. The heat from the sterilized water is thus absorbed by the raw water. The booklet is attractively illustrated with buildings where the apparatus has been installed.

Industrial Notes

J. E. Chisholm has opened a railway supply agency office at 255 Old Colony Bldg., Chicago. Mr. Chisholm has been in charge of the mechanical department of the Chicago Great Western and was, until recently, in charge of sales of the Chicago Steel Car. Co.

The Track Supply Association will hold an exhibit, September 9-16, in connection with the 30th annual convention of the Roadmaster & Maintenance of Way Association. The convention is to be held in Hotel Statler, Buffalo, N. Y. This Association is anxious to obtain, at once, names of all those desiring to exhibit. Further particulars may be had by addressing F. A. Preston, Sec. and Treas., P. & M. Co., Chicago.

The Chicago Car Door Co. has received an order from the N. O. M. & C. for equipping 400 box cars.

At the recent annual meeting of the Cement Products Exhibition Co., Edward M. Hagar, president of the Universal Portland Cement Co., Chicago, was elected president. It was decided to hold the sixth annual Chicago cement show in the Coliseum, January 16-23, 1913.

The Continental Car & Equipment Co., Inc., has opened a branch office with Mr. J. T. Kinberger at 607 Marquette building, Chicago.

The Kip Brush Co., New York, has made Wood, Bowers & Co., St. Louis, Mo., southern representative of the above company. The Kip company recently organized a special railway department under the charge of Harry M. Baxter, who formerly was with the Wolfe Brush Co.

The Sherwin-Williams Co., Chicago, has moved its office from the Steger building to the Peoples Gas building, Chicago.

The Bucyrus Co., South Milwaukee, Wis., has opened an office in the Brown-Marx building, Birmingham, Ala., under the management of E. L. Byron, who will have charge of the sales in the southern states.
and general manager of the Rockwell Furnace Co., has

Howard K. Porter, a southern representative of the Lorain Steel Co., Philadelphia, Pa., has been made manager of the southern railway department of the U. S. Metal & Manufacturing Co., New York, with office in the Candler building, Atlanta, Ga.

Mr. Geo. Price formerly with the Tide Water building Company has been retained by the Flintoke Mfg. Co., and J. A. & W. Bird Co., of Boston, Mass, to represent them in the Metropolitan district with offices at 66 Beaver St. New York, N. Y.

The Cambria Steel Co. has moved its Chicago office from the Western Union Building to 1860 McCormick building, Michigan boulevard.

Mr. J. B. Kirtley has been appointed Southern Sales Agent for the Manhattan Railway Supply Co. with offices at 1207 Mutual Bldg., Richmond, Va.

Recent Engineering and Maintenance of Way Patents

TIE AND RAIL FASTENERS.

1,026,657—Mike Chila, Whiting, Ind.

A metallic tie and rail fastener of I-beam construction adapted to support the rails, the tie having sockets formed therein, of inner and outer fastener blocks slidably mounted upon the tie and engaging the base flanges of the rails, each block having an oval recess formed therein with one of the walls of the recess provided with a lug, each block having the top thereof provided with a longitudinal slot in communication with the recess. A bolt extends through the slot and the recess into the socket of the tie, a head is carried by the bolt closing the slot of the fastener block, and a washer is detachably mounted upon the bolt within the recess of the fastener block and has a notch to receive the lug carried by the wall of the recess, whereby the fastener block can be shifted by partially rotating the bolt.

DUMP CAR.

1,026,694—J. O. Neikirk, Morgan Park, Ill., assignor to Rodger Ballast Car Co.

This car has an underframe comprising bolsters, longitudinal girders extending between the bolsters intermediate the center and sides of the car, leaving an open central space between the bolsters and girders, a hopper bottom extending downwardly in the central space, supports extending outwardly from the girders, sides extending upwardly from the outer ends of the supports, the ends of the hopper being inclined and extending upwardly to the top of the car and from side to side thereof, floor sections extending between the inclined ends of the hopper, the lower edges of the floor sections being pivoted along the upper edges of the girders, the free edges of the floor sections being beveled and their width being such that when turned inward the free edges will abut. Downwardly inclined ledges extend inwardly from the car sides with shoulders at the free edges. The horizontal dump doors between the girders and the car sides are pivoted at their inner edges. Operating mechanism for dump doors is located entirely beneath the same and below the floor level.

INTERLOCKING SWITCH STAND.

1,026,730—F. C. Anderson, Cincinnati, O., assignor to American Valve & Meter Co.

An interlocking switch stand having an interlocking plunger adapted to engage an interlocking bar secured to the point rails of a switch when the switch is in locked position, a dog adapted to prevent the operation of the interlocking plunger, the dog having an opening therein, a stem for the dog, a push-button for the stem, a housing in which the stem is mounted, a spring surrounding the stem within the housing and adapted to hold the dog in position to prevent the operation of the plunger and only permit the operation of the plunger when the dog is depressed by the push-button, permitting the opening in the dog to register with the plunger and allow the plunger to be operated.

DUMP CAR.

1,026,785—J. R. Bowling, St. Louis, assignor to Ingoldsby Automatic Car Co., St. Louis Mo.

A dump car comprising the combination of a plurality of dumping doors, locking means, common operating means therefor, and means for releasing either door while the remaining door or doors are locked, and operating means being actuated by the same mechanism for any door.

BOLTLESS RAIL JOINT.

1,026,791—J. H. Ezard, Hocking, Ia.

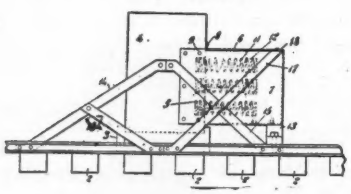
The combination with a rail provided with a socket having vertical walls and a V-shaped bottom, a portion of the socket being sunk deeper into the rail, another socket having vertical walls and a portion of the bottom of the last mentioned socket provided with a V-shaped bottom and the remaining portion relatively flat and at right angles to the walls, the portion of the sockets having a flat bottom being disposed deeper in the rail than that having the V-shaped bottom, a second rail having a tongue adapted to fit closely into the first socket, and a socket similar to the second socket of the first rail, a locking member arranged to fit into the sockets for locking the rails together, and a plate having portions arranged to engage with the lower web of the rails in question, for locking the member in position, and for affording means for attaching the rails to a cross tie.

SNOW FENCE.

1,026,806—J. I. Iblings, Cedar Falls, Ia.

A fence composed of a plurality of uprights connected by a plurality of superposed metal bars, the bars being longitudinally troughed, braces pivoted to the uprights, the latter being formed to conform to the shapes of the bars and the braces being formed to conform to the same shape and adapted to swing toward the uprights, and means for securing both the uprights and the braces to the ground.

1,027,098



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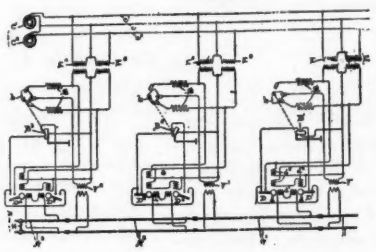

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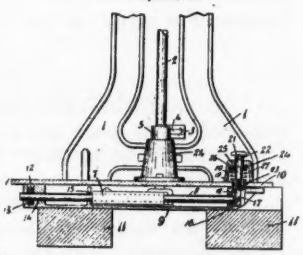

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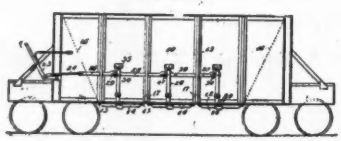

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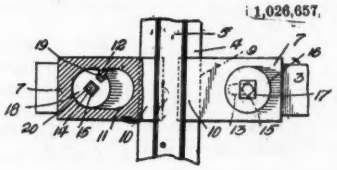

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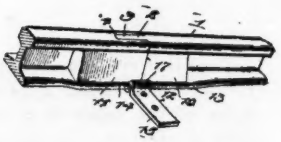

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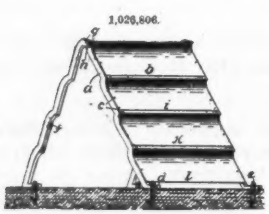

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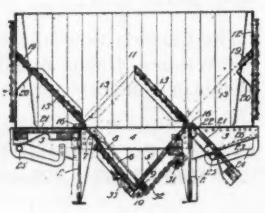


BLOCK SIGNAL SYSTEM.

1,027,046—L. G. Hawkins, Schenectady, N. Y., assignor to Union Switch & Signal Co.

In a block signal system, track circuits for the blocks, sources of current of different frequencies, supply connections for supplying currents from the sources to the track circuits, means controlled by train movements for varying the supply connections to vary the frequencies of the currents supplied to the track circuits, and a pair of track relays per block having track windings and co-operating windings supplied with current independently of the track circuits, one relay of each pair being responsive to current in the track circuit from the supply conections for that block regardless of the variations in the connections and the other relay being responsive to current with one arrangement only of the supply connections.

BUMPING POST.

1,027,098.—A. L. Bolt, Cincinnati, O.

A bumping post comprising a base, a post, the upper surface of the base being recessed to engage the post, a casing mounted on the post, a buffer mounted in the casing, springs interposed between the buffer and the post and mounted in depressions in the buffer and post, a pair of opposed braces on each side of the post, fixedly securing the upper portion of the post to the rails at points in front of and behind the post, a connecting brace on each side of the post interposed between the outer side of the rail and the rear post brace, and a brace on each side of the post opposed to the connecting brace and interposed between the outer side of the rail, and the upper portion of the buffer rigidly to sustain the same.

It is said that the Missouri, Kansas & Texas is planning to build a connecting line from Waco, Tex., to Trinity, a distance of about 130 miles, to connect with the line operating between Trinity and Colmesnell.

The New York, New Haven & Hartford has been making surveys for a proposed short extension of the Hanover Branch from Hanover to Greenbush.

New Dixon Railroad Booklet

We have just prepared a booklet treating of the various Dixon graphite products for use on the railroad. The entire Dixon railroad line is treated of and all other matters excluded—this booklet is of interest only to the various mechanical railroad departments.

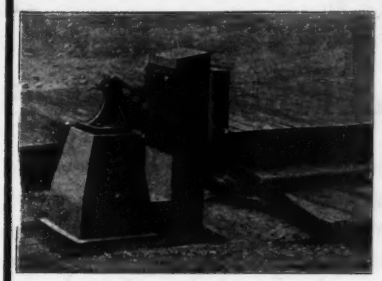
The application of dry graphite for lubrication, the use of Dixon's graphite greases, Dixon's Silica-Graphite Paint, crucibles, facings, crayons, etc., is all included in this booklet—a total of 40 pages. There is bound to be some matter to interest you here.

We have tried to make our booklet attractive in appearance as well as interesting to read, and to this end have included views taken of railroad stations and yards, stretches of track, signals, bridges, etc.

Write for copy of this booklet by number 187 R. R.

Joseph Dixon Crucible Co.

Jersey City, N. J.

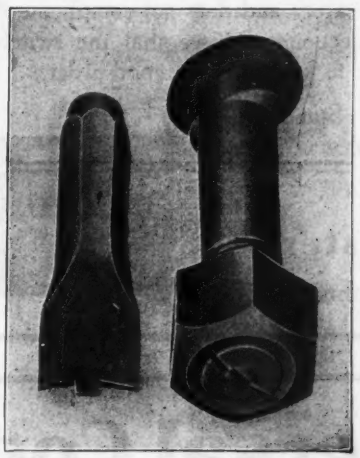


ELLIS PATENT BUMPING POST

Noted for Simplicity, Strength and Lasting Qualities. Adapted to all positions.

Mechanical Mfg. Co.,
CHICAGO, ILL.

THE CLARK NUT LOCK



Absolutely

SAFE

Absolutely

ADJUSTABLE

The Interlocking Nut & Bolt Co.
605-606 Arrot Office Bldg.
Pittsburgh, Pa.

The Trackman's Helper

Revised Edition—by J. KINDELAN

A Practical Guide for Track Foremen

Thirtieth Thousand

"It is so very plain and easily understood, its value to men of ordinary education cannot be estimated."—D. A. Dale, Roadmaster, West Shore Ry.

"I find the Revised Trackmen's Helper the most generally instructive and useful book for trackmen that is now obtainable. I think every Track Foreman and Roadmaster should have a copy of it."—D. Sweeney, Roadmaster, C., R. I & P. Ry.

350 pages; fully illustrated, 5¼x7½ inches.
Price, $1.50, net postpaid.

Practical Switch Work

By D. H. LOVELL
Division Superintendent Pennsylvania Ry.

An Instructor and Guide for Roadmasters, Section Foremen and Construction Foremen

This book is presented in a very clear manner, which is at once simple, thorough and practical.

The contents include chapters on General Turn-outs; Stub and Split Switches; Analysis of Curves; and a large number of tables for the quick and correct construction of any switch.

Cloth, 174 pages; 4½x6¼ inches.
Price, $1.00, net postpaid.

Maintenance of Way Standards, by F. A. Smith, M. E., C. E. - Price, $1.50
Standard Turn Outs on American Railroads, by F. A. Smith - Price, 1.00
Railway Curves, by F. A. Smith - - - - - - - - - Price, 1.00

Descriptive Circulars upon Application

The Myron C. Clark Publishing Co.
Heisen Building, Chicago

FOSTER

Interlocking Switch Stand

You make a careful inspection of switches to see that they hold the points up to the rail. The Foster Interlocking Switch Stand guarantees the points to be up to the rail and secured with two separate connections from the points to the ties. The lever will not enter the latch until the point is up to the rail and bolt locked. If there is lost motion in the connections or an obstruction between the point and the rail the lever cannot be forced down into the latch. With this stand the points must be kept adjusted within safe limits to be able to operate the stand.

Any track device which is not operated by experienced men must be simple and positive. One throw of one lever parallel with the track performs all operations with the Foster Interlocking Switch Stand. This stand guarantees safe switches between times of inspections and is easy and simple to operate. It provides additional safety and does not complicate the operation of your switches. Your inspection is to see that the switches are in good order and this stand is made to keep them in good order.

One throw of ONE LEVER operates Switch, Interlock, Signals.

Foster Interlocking Switch Stands have been tested in service and do all that is claimed for them.

Frank M. Foster

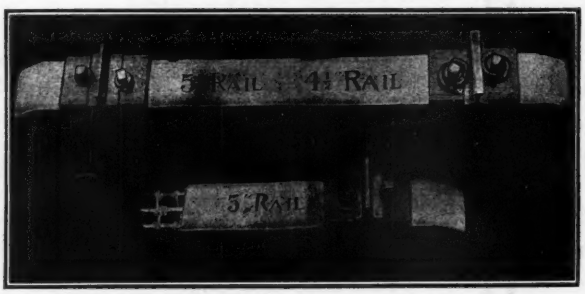
515 W. First Ave., Columbus, Ohio

The Universal Concrete Tie

Note carefully the details of the spiking device and the peculiar "V" shape of the base of the Tie at the center, which insures an absolutely perfect alignment, obviates spreading of the rails, or the slewing of the track. The heavy hardwood cushions preserve the rolling stock as well as the tie; last for six to fifteen years, and are then almost instantly removed by the loosening of the screw spikes by one man.

The Percival Patents

In use under various Trunk Line Railways for five and six years past.



The above cut illustrates the Universal Concrete Tie.

For further facts and full evidence, address the

UNIVERSAL CONCRETE TIE COMPANY

1408-9 Whitney-Central Bldg. NEW ORLEANS, LA.

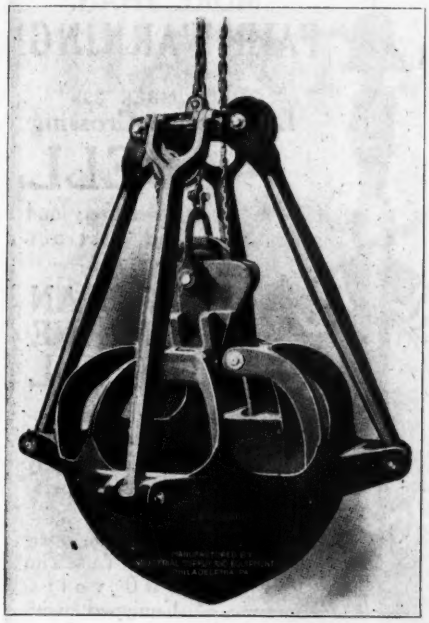
Trains are running sixty miles an hour over these ties, and have been so running for more than five years, yet they have had no repairs, realigning or even tightening of the spiking devices.

The reinforcement of our ties consists of four corrugated bars, the approximate length of the tie, and varying in size from 1-2 in. to 1 in. These are secured in proper shape by electro-welding the heavy binding wires. The truss core of the tie thus forming a complete unit within itself.

The best tie for terminals, because it is permanent.

The best tie for yards, because it is fire proof, rust proof, and will hold rails true to gauge.

The best tie for main lines and heavy traffic, because it is absolutely dependable under all conditions, as we can show in roads using them.



Rickards Cast Steel Orange Peel Buckets

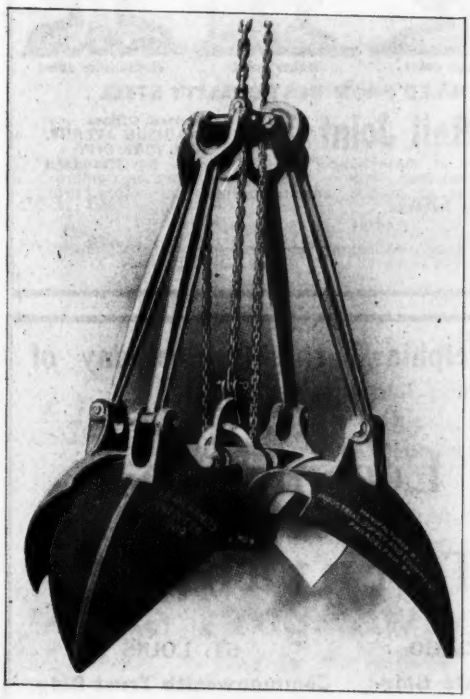
The Bucket for Hard Service

Rickards Orange Peel Buckets are constructed with four curved triangular cast steel blades, and when closed form a tight semi-spherical bowl, which holds the excavated material.

Rickards Bucket parts are interchangeable and are numbered and lettered. Reference to the number of the bucket being all that is necessary in ordering any part.

The Center Block is made of cast steel and fitted to carry and allow the bucket to hang central at all times.

All buckets are fitted with chain wheels, as this construction has been found more desirable. Buckets to be operated by wire rope will be furnished if so ordered.



The Rickards Orange Peel has been so designed that three sizes of blades can be used on the same crown rigging. That is, you can buy say a 1 yard Bucket and also buy ¾ yard and 1¼ yard blades for same rigging.

The Industrial Supply And Equipment Co.

407 Sansom Street, Philadelphia

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Make Your *Hand Car* ---into a *Motor Car*

You can easily install a **Belle Isle Motor**

on your hand car in a couple of hours. The engine will propel any load your car will carry. Save your laborer's strength for real maintenance work, instead of making him pump a back-breaking, slow-running hand car. With a gasoline car you will ***get there*** quicker—easier. You will have ***more time,*** your laborers will have ***more strength*** and ***more inclination*** to do a full day's work.

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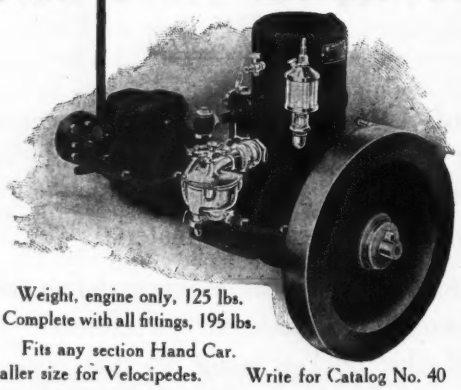
= 20 Man Power



Weight, engine only, 125 lbs.
Complete with all fittings, 195 lbs.
Fits any section Hand Car.
Smaller size for Velocipedes. Write for Catalog No. 40

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IT IS AN ENGINE BELL

The gravity operated circuit closer absolutely insures its operation.

Wound to operate on from 2 to 600 volts. Equipped with contacts for operating an

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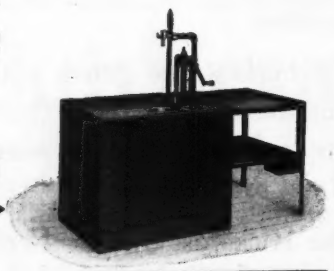
SIGNAL SUPPLIES
Chicago New York

Bowser Table Tank for Way Stations



It just fits the conditions at way stations or oil houses for cleaning and filling signal lamps.

The pump measures the oil into the lamp and the table catches any dirt or spilled oil. The table serves also as an ideal place for trimming and cleaning the lamps.

This is but one unit of the

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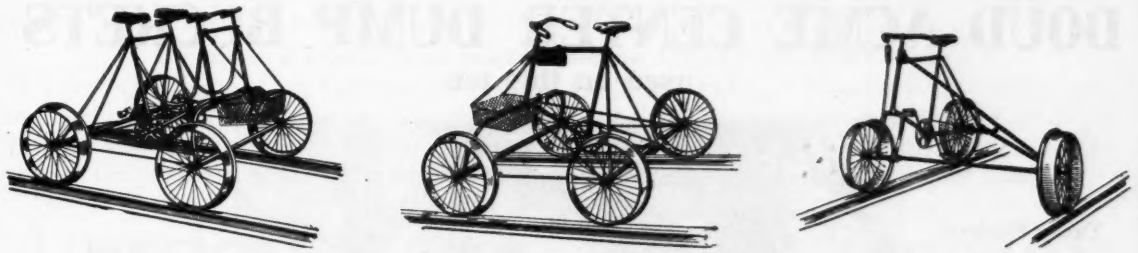

Light Inspection Cars are the Strongest and Lightest running known. The fact that we have not had a single complaint for the past year is proof absolutely that our cars are giving entire satisfaction. We shall be pleased to supply you with our new catalog that tells all about them.

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DEPENDABLE MANGANESE

is what you want. That is what you get when you order your manganese frogs from the ***Frog, Switch and Manufacturing Co.***

Our products are the result of 30 years' experience in the field.

Manganese Hard Center Frog

Wing rail pieces, throat, point and heel blocks are one manganese casting. The entire wearing surface of this frog is so completely protected with manganese steel that it is especially adapted for use under the most severe traffic. The manganese insert extends beyond the ends of the wing rails in the throat of the frog.

We have one of the largest and most modern plants in the country, and are prepared to give your orders ***prompt attention.***

The Frog, Switch and Manufacturing Co.

CARLISLE, PA.

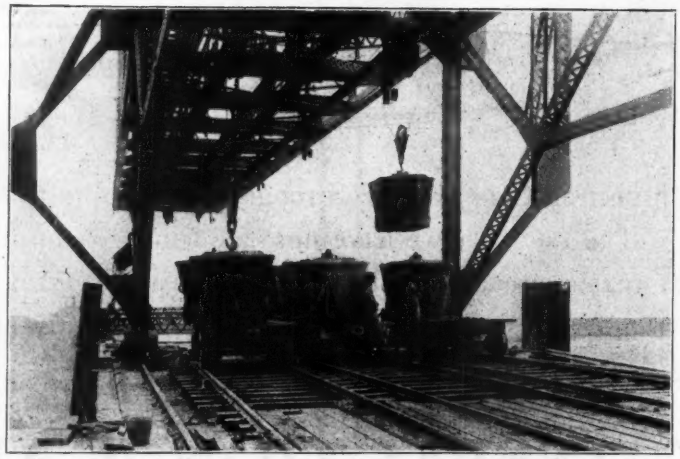
1-24-40-10

That was the way they ordered the 75

DOUD ACME CENTER DUMP BUCKETS

used on this job

These Buckets were ordered after a thorough competitive trial with the other leading makes of Buckets on the market



What stronger evidence of superior quality could be asked for?

The Hydro Electric Development, Keokuk, Ia.
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Doud's "Acme" Center Dump Bucket Gates Open

(Patented Apr. 5th, 1910)

SOME OF THE USERS OF THIS EQUIPMENT

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Doud's Center Dump Controllable Discharge Bucket

"Acme" Buckets are extremely simple in construction, swift and sure in operation and efficient in results; no clog or splash. We also make a perfect controllable center-discharge bucket, and buckets of all kinds.

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NOTICE—Maintenance of Way Officials, Chief Engineers, Roadmasters.

—Just to become acquainted with you we are using the space of this splendid magazine. To catch the June issue we hadn't time to prepare "Our Message" to you—Watch our future "Ad Messages" and Words of "General Knowledge" to R. R. officials.

We make a specialty of manufacturing RIGHT-OF-WAY GATES.

We are "Originators" of Galvanized High-Carbon Steel Gates (last forever), Self-Lifting Steel Gates (no dragging, therefore the farmer will shut them), Standard Five-Foot High Gates (horse high, bull proof, fool proof and hog tight) and we sell them to railroads cheaper than your present gates cost. ***You don't know your actual cost now.***

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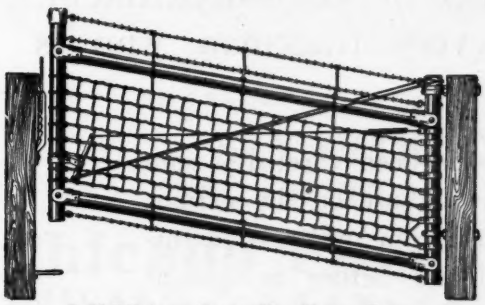
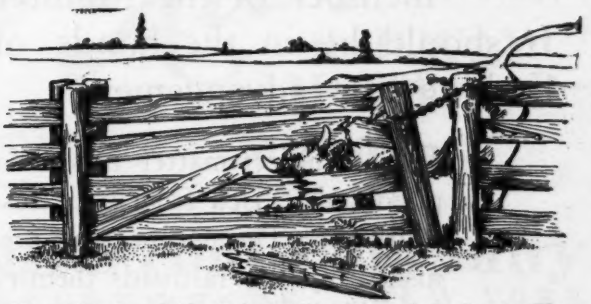
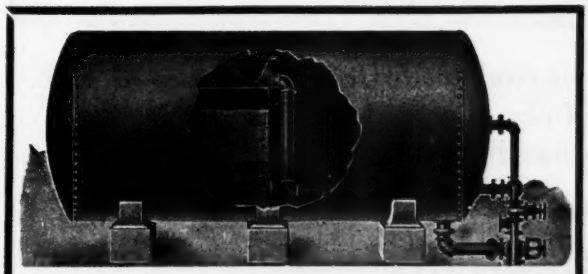
WE SHIP EVERYWHERE. R. R. Dep't—KANSAS CITY, MO., U. S. A.



Self-Lifting—Drags Up, Never Down



Cheap Metal and Wood Gates Too Expensive—Forget Them



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Water Softeners

FOR

Railroad Water Stations
Industrial and Municipal Works

Pittsburgh Filter Mfg. Co.
Pittsburgh
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The Johnson Car Replacer

Range and Capacities of the different types are as follows:

		If Not Over	Capacity.	Throat Opening	Wt. Each
Type M	for rail 12 - 45 lbs.	3½ inches high	20 Ton Locomotive	2 ins.	80
Type C	for rail up to 65 lbs.	4½ inches high	30 Ton Locomotive	2½ ins.	90
Type B	for rail up to 80 lbs.	5 inches high	50 Ton Locomotive	3½ ins.	110
Type A	for rail up to 100 lbs.	5½ inches high	80 Ton Locomotive	3½ ins.	145
Type Z	for rail up to 100 lbs.	6 inches high	100 Ton Locomotive	3½ ins.	165

The Johnson Wrecking Frog Company
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The Most Economical Paint in the Market.

You Specify Your Requirements

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YOU NEED "Track Standards"

A New Book full of up-to-date information for every member of the Maintenance of Way department. It should be in the hands of every trackman who is looking for advancement.

¶ The subject matter in this book has been carefully compiled and revised from practices now in use on the various railroads. The matter was prepared from information furnished by the railroads themselves, and before being put into this book has been read and approved by the Chief Engineer or other officials in charge of the department on each railroad mentioned in the work.

¶ We can state positively that no work of this character has been so carefully edited and fully approved by Railway Engineers before publication, as has this volume.

PROFUSELY ILLUSTRATED

THE SUBJECTS ARE

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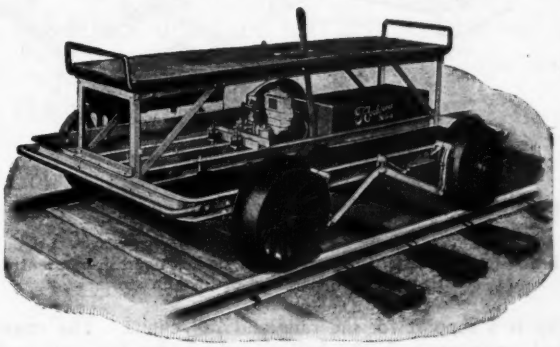
WE HAD IT ALL FIGURED OUT

We Knew That if we took the well-known *"Rockford"* Engine, and mounted it in a welded steel channel frame and eliminated dry cells, spark coil and timer, substituting therefor Magneto Ignition, and eliminated chain drive to cam shaft, substituting therefor direct drive through spiral gears, enclosed and running in oil



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WE WOULD HAVE A WINNER IN THE

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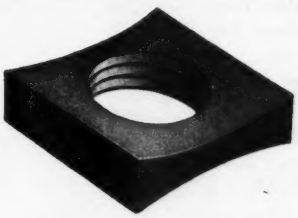
CHICAGO 1010 Fisher Bldg. BRANCHES EVERYWHERE NEW YORK 50 Church St.

Simple *Efficient* *Economical*

Three Reasons Why The

BOSS  NUT

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May we not have the privilege of showing YOU the many advantages and tremendous locking power of the **Boss Nut?**

A Post Card Request Will Bring Samples

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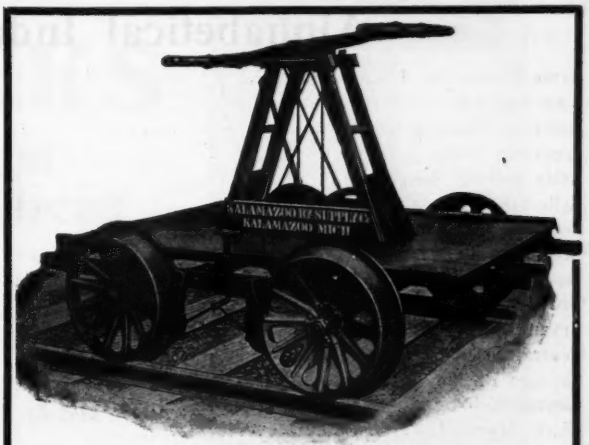

Kalamazoo Hand Cars

are equipped with the Kalamazoo Improved Reinforced Pressed Steel Wheel, giving 50 to 100 per cent greater wear than any other wheel of similar design or weight on the market. The car has stout gallows frame, thoroughly trussed, has taper wheel and pinion fits on axles, machine cut gears, flexible steady box and double acting brake.

16 Different Styles, Standard or Special

Catalogue of Track and Railway Supplies on Request

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Kalamazoo, Mich.

Western Representative: W. K. KENLY COMPANY, Chicago

COFFMAN'S PERMANENT WAY

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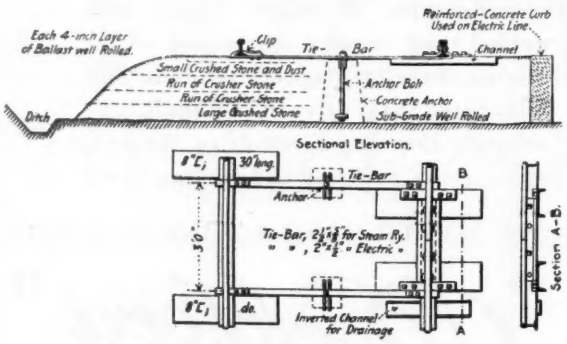
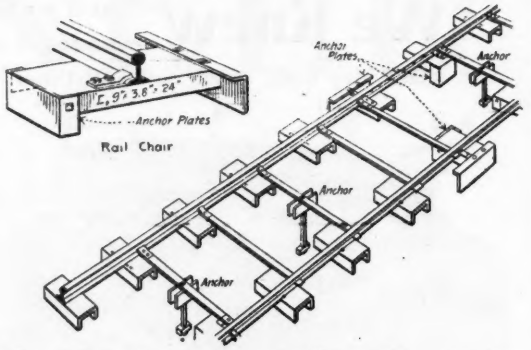


Track Construction with a watertight bed of rolled stone ballast.



Track Construction for very heavy traffic, used in connection with heavily rolled bed of broken stone.

A reinforced compacted monolithic bed or permanent way is a support for the rails and rail chairs. The chairs may be considered under the head of tie plates. My bed represents both the ballast and wooden ties combined. A bed constructed on my plan will answer every condition required of both, and more too. The alignment is permanently maintained, as well as surface and gage. It will admit of the use of anti-creeper appliances. There is a scrapping value in the steel after being used. The bed will not settle out of sight in the soft ground and be lost. It is practically water-tight, and has a tendency to prevent the settlement of embankments. It can be constructed to carry wheel loads of 30,000 lbs. each at maximum speeds.

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W. H. COFFMAN, Inventor
BLUEFIELD, W. VA.

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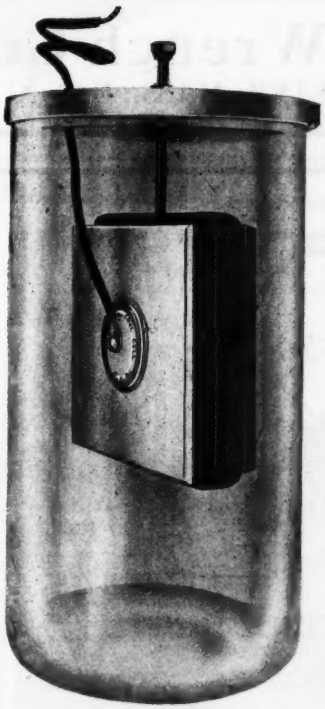
BANKS designed the first Copper Oxide-Zinc-Alkaline Combination for Track Circuit Work.

BANKS was the first to Compress Copper Oxide in a Containing Grid of Metal for the ideal Negative Plate.

BANKS was the first to give you Rigid Construction in an Assembled Element with great Mechanical Strength.

BANKS was the first to give you a Track Circuit Cell with Automatic features in giving you a predetermined internal resistance during the life of the Elements.



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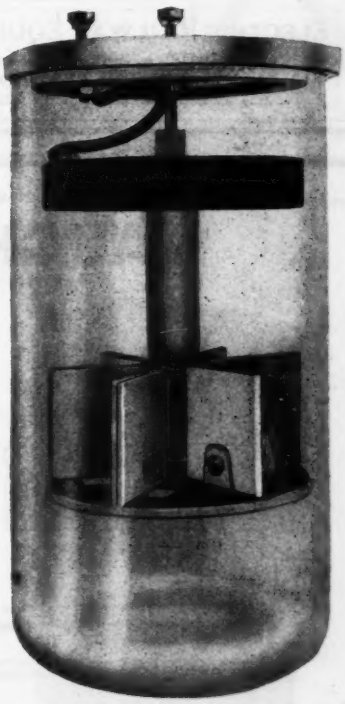
ALL
of the Above Valuable Features are Contained in the

BANKS
Signal Track Circuit CELLS

Which are Equipped With
N-W BINDING POSTS



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Trolley Brackets Plain and Ornamental for Wood and Iron Poles.
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Let us estimate on your requirements

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KEY MODEL EngineRoom AND Construction WRENCHES

4 SIZES:
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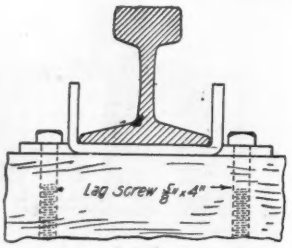
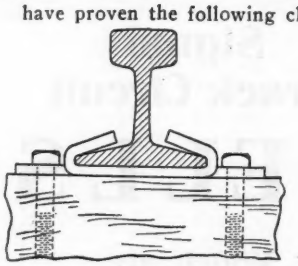
By a demonstration of over twenty months under both Passenger and heavy Freight traffic

VAUGHN RAIL SUPPORTS

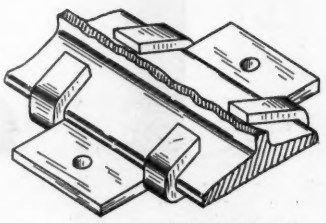
have proven the following claims:



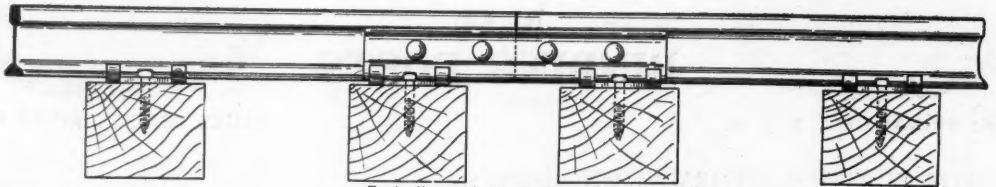
Side View
Support Ready for Application



Side View
Support Applied



View of Support Attached to Rail.



End View of Support Attached to Rail

No creeping, spreading or kinks. Supports do not loosen on tie or rail.
No deflection or mechanical injury to the tie.
No expense in maintenance since supports were applied.
Eliminates the purchasing of tie plates, because it is the best tie plate on the market, without its other merits.
Also eliminates rail braces, continuous joints, and anti-creepers.
It holds the rail absolutely in alignment either on Tangents or Curves.
It keeps your track to the exact gauge without the use of braces or other devices.
Preserves ties.
Permits the use of the less expensive class of timber.
It acts as an Anti-Creeper because it prevents wave motion of the track under traffic.
It avoids all possibilities of derailments due to rail breakage.
It does all these things, and at the same time costs no more than many tie plates now on the market, and is just as easy to apply.

VAUGHN RAIL SUPPORT COMPANY, Pierce Bldg., ST. LOUIS, MO.

EXCAVATING BUCKET

BEST ON EARTH

Standard Bucket Type "C" Closed

These

BUCKETS

are the

Standard Bucket Type "D" Closed

Most Durable Buckets Made. Built Entirely of Steel

IN ALL SIZES

A BUCKET FOR EVERY SERVICE

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THE G. H. WILLIAMS CO.

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Single Rope Bucket Closed View

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CEMENT PIPE FOR CULVERTS

We specialize in forms for plain and reinforced concrete pipes.

BELL MOUTH

or

GROOVE and TONGUE

Cheap, Durable, Strong

All Sizes

Diameters, 1-5 feet

Length, 2-6 feet

Any thickness of wall

State your requirements and prices on forms and reinforcement promptly furnished.

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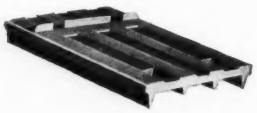
PITTSBURGH, PA.

TIE PLATES AND SPIKES

GOLDIE PLATE

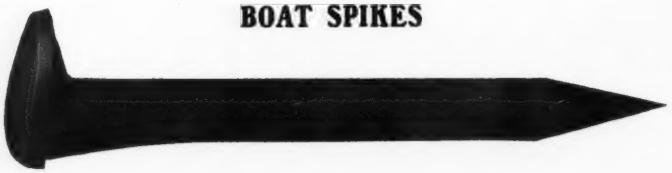


DILWORTH FLANGE PLATE

HARRIMAN PLATE

Standard and Special Railroad Spikes

BOAT SPIKES



Goldie Perfect Spikes a Specialty

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THE Merit of "Indianapolis" Products appeals to the discriminating *Engineer* and *Roadway Official*, who is progressive, practical and recognizes the value of Final efficiency and economy rather than low first cost with excessive maintenance and interrupted operating schedule.

He wants to know that all

Materials are strictly and absolutely first quality throughout.

Nothing but first quality rails and fittings go into any part of our product.

Nothing but American **"Stag"** Brand of manganese (the most dependable and serviceable metal of its kind yet produced) is used in our manganese work and in combination with scientific designing and liberal sections with a maximum safety factor—

Nothing is better (no exceptions).

He wants to know that

Workmanship and Methods are confined to the best modern practices only.

Our works are located at Springfield, Ohio.

We have every modern and improved facility for the most economical production of strictly High Class Product.

But employ no practices or methods to lessen the cost of production that are in any way detrimental to the steel or other material.

All rails are drilled—never punched.

All bolted structures are UNIT DRILLED and bolts a driving fit.

All rivets are compression driven—70 tons maximum pressure.

All manganese is accurately fitted and ground at a low temperature.

Result—Costs some more—worth much more.

He wants to know that

Design embodies strength and endurance and eliminates weakness and failures.

"Conservation of Energy" is a science which applied to Track and Rolling Stock has done more than any other one thing to bring into favor and recognition the **"Indianapolis"** Designs and their adoption by the leading and best roads in the country.

Our designs are the results of our own experience and observation together with a composite of suggestions of the most able Engineers and track men.

Designs that favor and protect both the structure and rolling stock.

Indianapolis built up designs of Regular Construction are reinforced and self-contained, prolong the life of the work.

Indianapolis R-N-R Designs of Manganese Frogs and Crossings have revolutionized maintenance and when introduced were a radical departure from any known practice, yet have been freely adopted and are extensively in use on nearly all roads of importance where purchases are not restricted.

Indianapolis R-N-R Designs have features of exclusive merit not found in any others.

Indianapolis Manganese Designs of Insert Special Work, were the first to feature the renewal of rail parts without removing from the track for repairs.

He wants to know

where to get what he needs.

It is made at

Springfield, Ohio.